

User, U.S. Government Inaction Hurt Independents

(Continued from Page 1)
rely are frightened that the market may withdraw at almost any time and that they will lose their money.

The users whose basic attitudes are at the bottom of this serious threat to the computer equipment suppliers are apathetic about the situation. They are remaining on the sidelines, apparently unaware of how the result of the fight will affect their future capabilities.

There are three types of financing needed by the independent computer manufacturer: venture capital to prove his capabilities, working capital to produce and sell his goods and loan capital to finance his customer installations.

Few other industries have to finance their customers. Most of them expect to receive full pay-

ment 90 days after the goods are shipped. Even when it is not paid in full, auto manufacturers expect to get an agreement to pay over two or three years, and they then can sell the agreements to the institutional lenders.

But DF customers expect to be given the time, and to be able to cancel at any time on a 30-day basis — so their agreements have always been hard to get financial support for.

After DF customers are like the new pioneering firms who dare compete with IBM will be able to get loan capital support so that the venture capitalists, who are needed to start them, are withdrawing from the market.

The venture capitalists can in full detail during a tour of the country after IBM actions. Already, rumors were rampant. Rumors

of employment cuts, rumors of redirection of loan money into lending undisturbed areas. On the West Coast, rumors have centered on a large bank which has bankrolled many computer ventures, including the financing of non-full-price software. Rumors of such financing being stopped. And that the loan department concerned is becoming unexpectedly cut back. Almost every concerned financial institution is holding so many meetings that the boundaries of what is bound to arise.

Whether the rumors are true is not the point. The important fact is that they exist, and are already forcing some companies to withdraw from the market. The ultimate financial balances supporting customer financing. The venture capitalists notice this has happened even though IBM has only attacked part of

one of the smaller independent markets.

And they wonder what would happen if this corporation repeated its actions elsewhere. They remember Carterfone. That case was won, but the company was lost. They remember RCA, and the disturbance that its withdrawal caused in the markets. And the venture capitalists don't see any way to prevent such a disturbance in the future, and they know that if such disturbances continue, loan funding may be impossible.

IBM, of course, has no such worries. It has its own resources. It can draw on its Prudential, Equitable, and other stockholders those 30-day agreements. The more the loan market is disturbed and the more difficult customers have in financing non-IBM equipment, the more IBM can benefit. So IBM's backers regard a disturbed loan market situation as additional safety for their loans, rather than a detriment.

Further, the suit asks for a "preliminary injunction restraining the defendants and their agents from soliciting, receiving, maintaining incomplete and/or inaccurate account records . . . and from circulating, disseminating, publishing or in any way divulging information from such records . . . to persons, agencies or organizations including prospective employers and any prospective employees."

Dissemination of such information serves no legitimate governmental purpose. The dissemination of such information serves no valid governmental function or legitimate governmental purpose."

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by the court in New York, but the concerned official continued to deny his request for disclosure of his license, Cowan adds.

In his suit, Cowan charges that "it has been and is the practice" of the FBI, Justice Department and their agents "to hand over, divulge, publish and circulate information . . . to persons, agencies and/or inaccurate account records . . . and from circulating, disseminating, publishing or in any way divulging information from such records . . . to persons, agencies or organizations including prospective employers and any prospective employees."

This dissemination of criminal information has "caused irreparable injury to the plaintiff since it has directly caused him loss of his job," Cowan claims.

Cowan appealed explaining that his case had been dismissed.

Extension Sought on Sharing Data

WASHINGTON, D.C. — The FBI is seeking to extend for another year its authority to share criminal data bank information with banks and state and local officials other than law enforcement officials.

The move, contained in the agency's \$336.9 million budget request for fiscal 1973 (which starts this July), will come under close scrutiny by Sen. Sam Ervin (D-N.C.) and the Senate Select Committee on Constitutional Rights, subcommittee sources said last week.

The FBI presently has the authority to share criminal data bank information with individuals to federally chartered or insured banks and to state and local officials for the purposes of employment or licensing, but that authority runs out at the end of fiscal year 1972 (June 30).

The FBI gained the authority as part of a little known section (902) in an obscure supplemental money bill (Public Law 92-184, Chapter 10) which was passed by Congress with little debate as it rushed to adjournment last year.

Previously the data had been barred by a court order from sharing such information with any one other than other federal agencies for employment purposes.

The move, by Federal District Court Judge Gerhard A. Gesell here last June, was hailed as a breakthrough by civil liberties groups, but the ruling was overturned by the legislation in the supplemental appropriations bill last year.

The new legislation before the Congress would extend the FBI's authority to disseminate information from its data banks until June 30, 1973.

Normally, budgetary bills are only examined by the appropriations committees of the House and Senate, neither of which have yet started action on the FY1973 budget.

Much of the testimony, including that of FBI director J. Edgar Hoover, is still secret, but he has been invited to appear by the Senate committee, which contains no reference to the extended authority sought by the agency.

(Continued from Page 1)
concerning the accident or the exact time the policy had been reinstated, automation provided a notice reinstating the policy, effectively retroactive to 12:01 a.m. on Oct. 4 — approximately 45 minutes before the accident occurred.

A month later, State Farm notified the plaintiff that the reinstated policy could not be

effective until the time when the company actually received payment to its agent, which is approximately 30 days on Oct. 4.

The trial court held that State Farm voluntarily and intentionally waived its right not to renew the insurance contract and agreed to extend the coverage for the period of time when the accident occurred.

In appealing that decision,

Students Buying Ghosted Programs

(Continued from Page 1)
assigned number to gain access to the university's computer to test and debug the program.

Computer Time

Each student in the course is given a special identification number that allows him access to a predetermined amount of computer time. The student must then determine the amount of time needed to write and debug the particular program he is working on.

Since the "professionals" programmer can often complete the assignment in less time, the student would be able to, sources said he would probably be able to use the extra time on the university's computer for his own projects.

The firm gets it "tries to keep prices down so that students could afford the service and noted that most of the profit — around 70% — goes directly to the programmer hired to do the work."

like the disk controllers that have been around for a long time — but it's designed to provide flexible service for the user, instead of forcing his growth along a path that IBM has predetermined for him. And that is a breakthrough.

The controller is programmed to control 2314s, and is ready for full funding.

However, potential backers can't help but notice that IBM may believe the controller can cut into IBM's markets, and that IBM may react strongly. The fact that IBM has had the capability to put out essentially the same product in several areas, and failed to do so, (therefore essentially emasculating its technical staff) only underlines the chances of arbitrary actions being taken which can result in the loss of the loan capital. And it must make some potential buyers think twice about financing it.

But, if International Computers & Peripherals — and the many other firms that it — can't be graded and is not able to put its products before the user, then the U.S. computer customer will not have the wide choice of equipment to choose from which goes to the user. Unless, of course, the source is going to come from outside the country, where there is less fear of IBM. (This is the subject of next week's report.)

Meanwhile, the U.S. independent computer manufacturer is being hurt. Not because he can't compete with IBM as a computer manufacturer, but because he can't compete with it as a financial institution.

'DP Error' No Defense, Judge Says

(Continued from Page 1)
concerning the accident or the exact time the policy had been reinstated, automation provided a notice reinstating the policy, effectively retroactive to 12:01 a.m. on Oct. 4 — approximately 45 minutes before the accident occurred.

A month later, State Farm notified the plaintiff that the reinstated policy could not be

effective until the time when the policy had been renewed, the policy and the reinstatement had been automatically handled by the computer system.

The court of appeals, however, held that State Farm had the facts about the accident before it renewed the policy and did not renew it.

The trial court's findings leave no doubt that State Farm was in full possession of all relevant information concerning the accident before reinstatement was actually issued," the court said.

"The fact that the company's purchasing division may not have had knowledge of the accident until after the payment was placed on the computer is not controlling."

"One hand of the company must be aware with what the other hand knows and does," the court ruled.

In addition, "the computerized reinstatement was not unavailable as State Farm alleges," the judge said.

The court concluded that "holding a company responsible for the actions of its computer does not exhibit a distaste for modern business practices as State Farm asserts."

The court operates only in accordance with the information and directions supplied by its human programmers. If the computer does not think like a man, it is man's fault."

Calif. Centralization

Huge Savings Seen With Welfare Plan

By Marvin Smallheiser

CW Correspondent

SACRAMENTO, Calif. — A planned computerized welfare information system that could save the state an estimated \$133 million annually will have to overcome tough opposition before it is approved.

The system, said to cost \$4 million, was proposed by the state Department of Social Welfare, which is now reviewing recommendations made by the state's Department of Finance, where a spokesman said, "Our basic desire is to implement the system as soon as possible to begin to accrue the savings." If modifications in the original proposal can be made.

Legislative committees, however, are holding hearings on the proposal and some sharp criticism based on a legislative study is expected to be aired.

Carl B. Williams, chief of the management information systems branch of the Social Welfare Department, said the terminal-based system would connect California's 58 county welfare departments to a centralized welfare management of 12 to 14 million characters. It would enable citizens at county branch offices to inquire about an applicant's eligibility in minutes instead of hours.

Reports and inquiries would go through CRTs, except in small counties that would have to use teletypes. Counties with less than 100 cases would telephone a larger, neighboring county.

A spokesman for the Office of the State Legislative Analyst said the feasibility study was inadequate and there were shortcomings in the development of the system as well as the request for proposals.

The spokesman said it was recommended that the deficiencies be corrected before the legislature grants funds.

Williams said the system would reduce fraud costs by \$28 million, grant errors by \$51 million and administrative cost by \$44 million.

The system would set up a centralized index of known welfare applicants, randomly accessible on-line, so that a county getting an application could key in through a terminal and find out whether a person is on welfare or has been in any two of the last five years.

The system would also enable the department to get income reports from the Department of Human Resources, which collects the information for unemployment.

Sheriff's Records To Be Computerized

LOS ANGELES — The county board of supervisors has approved a proposal to computerize the Los Angeles Sheriff's Department records.

The project will take two years and will involve the conversion of all records in casts, fingerprints and record folders. It will be funded with \$1,205,213 in federal money and \$804,454 from the county.

The county is negotiating with the city to participate so that the computerized system will be available to all criminal justice agencies in the county.

County Study OK'd

LOS ANGELES — A comprehensive management study of Los Angeles County's data processing operations has been approved by the board of supervisors.

An eight-month study will cost \$174,640 and will be made by Arthur Andersen & Co., Los Angeles.

The study is intended to strengthen the department's operations and would also analyze the county's long-range plan to consolidate seven existing data center groups into four information processing facilities linked by microwave.

ment insurance benefits.

A third phase of the system would reduce grant errors by enabling the department to do a pre-audit on grants and correct over-and-under-payments.

The reduction of administrative costs would be achieved by cutting the amount of county manual reporting, Williams said counties now have to provide between 1,400 and 2,000 separate reports annually.

The major problem in developing the system, Williams said, is that 58 counties now have several forms of automation and many types of equipment and sophistication.

The system will take information off the front end, as it comes into the county welfare office, before it is entered into individual systems.

The welfare department has a Burroughs 3500 and an IBM 360/90, plus plans to add equipment. Most of the 12 to 14 billion characters of information would be on tape, at least for some time, Williams said.

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CW Southern Computer Users' Forum

On-Line Entry Systems Cut Clerical Decisions

ATLANTA — "I'm sold on full record display for any kind of input device," one of the area's leading users of keypunch replacement equipment said last week at the Atlanta Computer Users' Forum and Exposition sponsored by Computerworld. "Video display does not bother the operators of key-to-disk or shared-processing input systems, since they operate in real time at the 'on-line' unless they know they have committed an error, according to Jerry Finley, EDP input manager at Rich's department store.

While some users feel a CRT

is necessary to be able to type" in order to operate on-line entry systems.

"In three weeks, we can teach typical on-line terminal operation to other general worker," he said, "and have a worker productive at the end of that time."

Other manual systems for data entry sometimes required up to a year to learn, according Jones, author of the on-line data systems workshop said, "and we had a 40% annual turnover rate."

On-line data entry reduces clerical decisions, since the computer can prompt the operator if data flexibility helps balance the considerable cost of operating in this manner, he added.

Most problems encountered by OCR character recognition equipment can be overcome by quality control before scanning, according to panelist and OCR software leader Glynn Ingram of Atlanta Gas Light.

Quality control of the printer is his firm's "biggest single problem," he said. The print train is replaced about every six months, with careful attention to the ribbon. If characters are too close together or if there is a vertical streak, the printer will stop, problems develop, he said.

Documents must also be cut properly. His firm uses register marks to ensure accuracy. If burst forms are used, quality is vital to prevent jams.

The error rejection rate is 1.5%, one meter reading cards, and an average of 2% for cash forms. Mailed receipts, he said, have a

Dallas Next Stop

The Computerworld Computer Users' Forum and Exposition continues to draw an average of 2,500 people per city, through Atlanta, according to preliminary figures.

The three-day conference is being held this week in Dallas, with next week being reserved for travel to the West Coast.

In Los Angeles, the show will open April 4-6; a Monday to Wednesday format will be used in San Francisco, April 10-12.

lower rejection average than those paid over the counter, which have frequently been folded or otherwise slightly mutilated.

John Wilson, president of Horne Wilson Inc. and leader of the intelligent terminal panel, indicated that intelligent terminals answered his need for a "compromise between the luxurious and the acceptable" data entry techniques.

"We were after labor savings and reasonable cost reductions outside," Wilson reported, in explaining why he chose intelligent terminals.

The most common data entry techniques in the supply industry can usurp up to 1-1/2% of sales, he continued; "immediate access" was too expensive, he said.

Retransmits Data

"So, we chose batch," with additional capabilities of intelligent terminals.

By eliminating Wilson's inventory problems are not common to all industries: he carries 64,000 different items, but only has an average of 64,000 transactions per month.



Users in Atlanta inspect ICL's 7330 disk drive. ICW Photo by E.J. Bridel

Requirements Most Vital To Planning Dial-Up Net

ATLANTA — Teleprocessing takes many more months than much more attention to detail than a straight DP site, noted Jack Granahan, of TRUSCO Data Systems, at his workshop on leased lines at the Computerworld Forum on data communications.

Because of the regulations on the phone companies, they often

nomics of data to be moved, he said. "The user needs to know what facilities to accomplish what should be known his requirements."

With the general philosophy that the phone company runs a cheaper service than he could, he learned to know Bell's capabilities and to work with its present system.

Jensen suggested that users could instruct the terminals to initially print out data in a standard telegraphic format so that an inadequate transmission line could be recognized.

Bureaucratic Problems

One user mentioned his experience in dealing with "bureaucratic problems" in his dealings with Bell. His firm solved the problem by becoming a long lines customer, so his representative is from AT&T, rather than a regional Bell.

One should assess carefully the validity, magnitude and economic value of hardware needed for on-line applications "such as backup" at Southern Railway, according to A.C. Whitehead, director of computer programming.

And equipment has invaded in case of a power failure, he said, adding the company has also acquired uninterruptible power supply and off-site tape storage as part of its security system.

Southern Railway's system handles 20,000 direct inquiries a day, regarding car and freight movement. Railway customers use TWX or Telex terminals to send messages based on the carrier's IBM 360 equipment.

Bernard McIlhenny, of the Atlanta Public Schools, leader of the common carrier workshop, told attendees he had worked with "fourteen different representatives" from the phone company in the last 18 months.

This presents a problem, he noted, since "we have to brief each new representative on our situation." The new representative, he said, "will bring along the notes left behind" by their predecessors, McIlhenny said.

AT&T is placing "artificial limitations" on users of independent equipment, McIlhenny believed, and said that the requirement to enter a data signal "at minus 9 dB" is not fair, "when Bell can enter their signals at 0 dB." Users need to be aware of these restrictions involved in deals with the phone company and with independent suppliers of data equipment, he continued.

Early Auditing of Programs a Cost-Saver

ATLANTA — If you can catch programming errors at the earliest possible stage, the cost of correcting them might be measured in "hundreds of dollars" rather than in thousands, according to Cleve Grattit, head of computer programming at Delta Airlines here.

Grattit emphasizes "extensive job control" techniques and a "string orientation" for what he considers an efficient, even dynamic, DP shop.

Line responsibility in all departments, plus internal standards, have also improved Delta's efficiency, he told attendees during a session on operational efficiency.

There is a control group "between every job step," whether it be in the input, processing, output or distribution of programs, he said. By auditing programs and stopping early in these stages, and stopping a job soon as errors are recognized, a user can save machine time and money, he noted.

Others spoke of improving efficiencies that were discussed in included operational procedures and education.

The diffusion of EDP is part of the effect of increasing minicomputer usage, Lecht noted, while another user suggested "doing

away with all compilers" to keep minimum dedicated to only one or a few applications.

George Martin of the Georgia Department of Transportation told his audience on independent peripherals that the decision to install independent equipment saved the state \$50,000 in 13 months.

His center has 16 Memorex disk drives, Telex and IBM tape drives along with a 360/40 and 360/50.

In evaluating equipment, he

suggested the user have its own technical staff evaluate throughput performance using benchmarks oriented toward his specific needs. An inappropriate benchmark can yield very misleading results, he said.

Throughput should be evaluated in conjunction with cost, taking into consideration the user's needs and anticipated growth, he added.

It may be to our advantage to "downgrade," he said. The DP manager should also remember his users when looking at equipment, and its ability to satisfy them.

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Personnel Resistance Also

License Plate Renewal Plan Survives Undertraining

By E. Drake Lundell Jr.

OF THE CW STAFF

LOUISVILLE, Ky.—Overconfidence, undertraining and personnel resistance almost sabotaged the new Louisville-Jefferson County computerized vehicle license plate renewal system.

The Computerized Auto Registration System (CARS), operated jointly by Louisville and Jefferson County here, was designed and written in about 85 days, but not enough time was left for training, according to Edward W. Mueller, director of the joint driver processing department.

At first there was a general overview of the city and county said the system was oversold to people in the county.

"They told everyone there would be no problem or delays with registration," he said, "so everyone waited until the last minute to get their plates, causing a jam during the last two weeks of the registration period."

State Law

The system was inaugurated because state law requires everyone to register their cars in January and February of each year, causing a crush on the county clerk's office which administers the program.

Louisville and Lexington are the two major cities in the state and both experience some problems at renewal time, an observer said, but the smaller counties like the arrangement since they only have to put extra people on the payroll once a year.

Because of the lack of training and education in the use of the CRT-based system, many problems have plagued the system, Mueller conceded.

With the system, the operator just had to type in the car owner's name, license number and the computer (an IBM, 360/40) responded on an IBM 2360 display with all of the information stored on that vehicle.

The operator then typed in the new 1972 license number and updated registration and title information. The system would automatically print out the 1972

registration and title papers.

The computerized operators, unfamiliar with CRTs or computers, were quick to blame most of the problems on "the computer," when in fact they were not computer problems, Mueller said.

In one case, he said, one of the four output lines tied into the system ran out of license plates, which were supposed to be picked up manually.

Instead of telling the people waiting in line they were out of plates, however, clerks at the center told the waiting car owners to come back later, not working.

Many of the people used to operating the manual system also were reluctant to use the computer system, Mueller added.

In some cases clerks would stop using the CRT units and type out renewal applications on old typewriters as soon as supervisors left the room.

The only way to tell this was happening, Mueller said, was to watch for the clerks with large lines, since most of the clerks were in separate rooms.

Hardware Problems

The only problem caused by hardware failure was grounding of the system when it first went up at the beginning of January, he said.

The ungrounded electric circuits were interfering with the telephone lines, he said, causing problems in the system. A few \$15 transformers solved the problem, however, he added.

In some cases it appeared the hardware failed, he said, such as when an employee inadvertently switched off a printer several times. That caused a jam in the DP machine, until the cause was found.

In addition to speeding up the service to

car owners, the system allows the county to process applications with fewer employees.

In the past the county had to add as many as 150 extra clerks for the processing program, with the new system it has been able to cut that number in half.

The manual system of updating the records also wasted time.

"It formerly took as long as eight months before police officers had access to accurate property valuation information. Now, even while a clerk is handing the new plates to the owner, his vehicle license number is recorded electronically and police officers can recover it when needed," Hallahan said.

And since the police files are being automatically updated, so are the files of the property valuation administrator, who levies auto taxes in the county.

Radiologists Test Retrieval System

BOSTON—Radiologists at the Beth Israel Hospital are developing a retrieval system which will let them generate and retrieve patient reports directly by computer. Previously, limited retrieval, and only by broad categories, was possible.

The computerized version of the system, now in the experimental stage, is based upon alphanumeric coding of the major symptoms of any abnormality that can be seen on radiologic examination—the location of the disease, a description of its features and its diagnosis.

Each category is subdivided to permit coding to the smallest practical unit.

For institutions without computer capabilities, the classification scheme may be followed by simply flipping through a coded handbook prepared by the Beth Israel radiologists. With the manual method, a simple card file, marginal punch cards or IBM cards may serve as the storage medium.

Instead of dictating or writing a long narrative as is standard today, the radiologist sits at a keyboard and types in a short series of codes. Retrieval of any report for scientific review is easily accomplished. To the patient's primary physician and numerous on the floor with him at the time the report is needed, the patient's report may be immediately transferred from the radiology department to the patient's floor.

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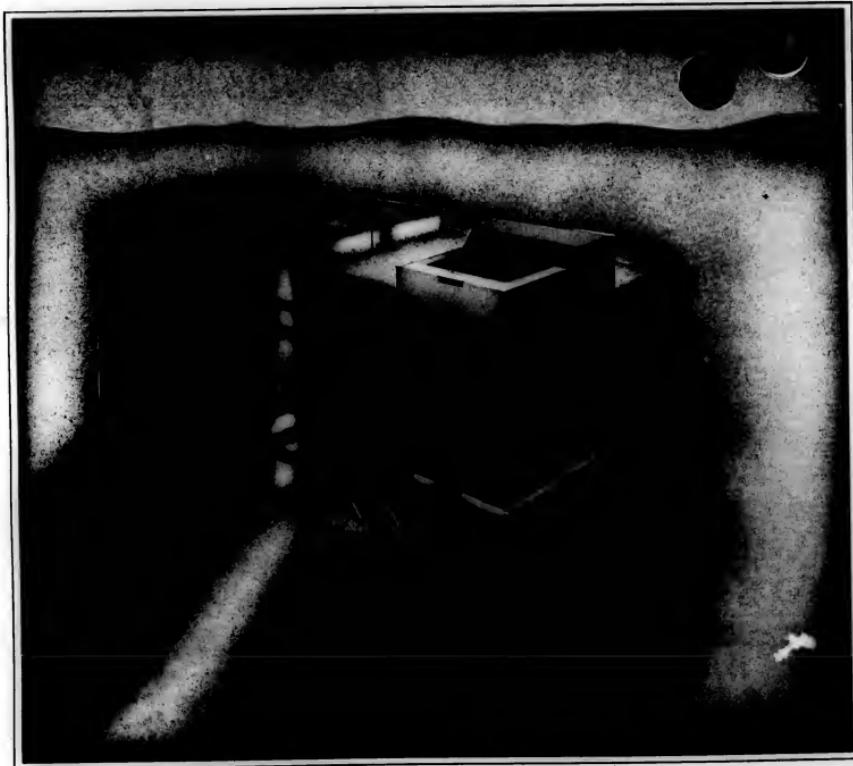
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Pay Dates Wrong, 12,000 Checks Voided

Dover, Del. — Because a computer program was not modified to take into account revised pay dates, more than 12,000 incorrect state employee payroll checks were printed recently, according to John T. Hill, director of the state data processing center.

The program was not changed to adjust pension withholdings to note that the workers were getting paid a day later than usual and so the checks reflected too few deductions. State payroll dates

were changed because of a new state law that requires payment on the first and sixteenth of each month instead of the fifteenth and thirteenth as had been the case.

The incorrect checks were sent to the state treasurer's office where they were voided and kept on file for future audits.

"People make mistakes... computers don't. They only do what you tell them to do," Hill added.

Mounties Hold Bombing Suspect

OTTAWA, Canada — One of the brothers wanted by the Federal Bureau of Investigation in connection with a bombing at the University of Wisconsin in Madison in 1970 has been arrested by the Royal Canadian Mounted Police in Toronto.

Karleton Lewis Armstrong is currently awaiting extradition proceedings.

After the bombing of the Army Mathematics Research Center in which one researcher died and \$1.5 million of computers were demolished [CW, Sept. 2, 1970], the FBI began a nationwide search for four young men.

One of the suspects still at large is Armstrong's younger brother, David. The five face charges of first-degree murder, sabotage, destruction of government property and conspiracy.

News Wrapup

were changed because of a new state law that requires payment on the first and sixteenth of each month instead of the fifteenth and thirteenth as had been the case.

The incorrect checks were sent to the state treasurer's office where they were voided and kept on file for future audits.

City DP 'Short-Circuited'

PITTSBURGH — Half of the city's computer system, leased from NCR for \$26,000 a month, has been switched off, the victim of the mayor's cost-cutting drive.

William Smith, a 35-year-old DP manager, blamed budget cuts for the loss of a modernized police communications network; the rationing of space on the remaining memory bank, which has stalled efficiency programs for many city departments; and a workload for the following equipment amounting to little more than adding machine terminology for simple tasks.

Savings from the cutbacks amount to about \$4,000 each month and the city plans to spend about \$22,000 for monthly rental of the remaining equipment.

Tax Discrepancies Shown

SPRINGFIELD, Ill. — A comparison of state and federal records on 1969 tax returns from state taxpayers has revealed 178,000 cases of discrepancies, according to state Department of Revenue Director George C. Gandy.

A computer has shown discrepancies to include taxpayers who filed federal tax returns in 1969, but didn't file state returns and taxpayers who filed different information with state and federal officials.

The Internal Revenue Service supplied the state with a tape of information on federal tax returns for 1969 credited to Illinois. Records of the 151,114 tax-payers who filled out federal returns but failed to make state returns will be checked to determine whether they should have paid Illinois taxes.

Short Work Week Catches On

BOSTON — Two-hundred and ninety employees of the John Hancock Insurance Co., will soon begin a 13-week experiment with the four-day work week.

The workers are in four divisions: record services, direct collection, mail and data processing. The goal of the experiment is to "allow the company to make a valid determination as to values and/or the drawbacks of the four-day work week."

'Computer Made Me Do It'

PARIS — So now, maybe, you won't have Uncle Harry to blame for that rotten Christmas tie.

A department store here boasted it could select the perfect Christmas gift for anyone... and if it used a computer. The store provided the computer with age, sex, weight and personal pleasures of the recipient and made thousands of selections from the information given it.

After the holidays there were still long lines of people waiting to exchange gifts picked for them by the computer.

After a program modification, the deductions were recomputed and the correct checks printed to meet the March 1 deadline.

"People make mistakes... computers don't. They only do what you tell them to do," Hill added.

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Special Report

Government Agencies Pioneer

Mass Storage Systems Just Waiting for Daring Users

"It becomes a numbers game... you start to make comparisons with hundreds of tape reels and packing densities of 700,000 bit/in. and the mind begins to boggle." — a user.

By Ronald A. Frank
Of the CW Staff

Mass storage systems may well be the wave of the future but few of the huge systems have actually been installed.

When users consider mass storage systems, they have to think in terms of billions or even trillions of bits. And price tags around the million-dollar mark are not uncommon.

"It becomes a numbers game," one user says. "You start to make comparisons with hundreds of tape reels and packing densities of 700,000 bit/in. and the mind begins to boggle."

But despite the statistics, the large storage systems are close to being accepted by users.

Most of the mass storage makers feel their systems are best suited for applications with relatively few accesses of large blocks of data. Within this general frame-

work are government agencies, insurance companies and banking institutions.

While these large users probably will be among the first to buy mass storage systems, smaller-scale applications may well follow for medium-scale system processing centers.

Unusual Systems

When users consider a mass storage system, conventional trade-offs don't apply. It is difficult to think in terms of benchmarks since, in most cases, there can be no direct comparisons with other systems. Some users are above storage capacity but others are below it, especially when answers like \$0.0007/bit come up.

One mass storage system on the verge of its first delivery is the Ampex Terrabit Memory. The TBM is scheduled to be delivered to a government agency "within the next six months," says Art Lemay to Manfred Wildmann, general manager for the storage system. Because of government restrictions Wildmann will say only that the TBM has been in operation at his company since last September, and when installed it will be running continuously until the end of the year.

The TBM is described as a tape system but that is where the similarity ends. The system uses 2-in. wide video recording tape. Data is recorded as FM represent-



This Terrabit mass memory system has been operating in-house at Ampex. The first user installation is scheduled later this year.

ation of a digital bit stream. The file is completely transparent to the user and is automatically encoded and decoded during read or write operations, Wildmann says.

Big Reduction

"With a TBM, a 500-to-1 reduction is possible in recording media when you convert from fully packed conventional tapes," Wildmann says. "And most tapes are only 25% packed so here a user would see a 2,000-to-1 reduction for the same amount of data."

A "minimum" TBM system is the equivalent of about 13,330 disk systems, Wildmann says, but he doesn't like to make the comparison. "Most TBM users will be replacing tape drives," he predicts.

One of the most unusual mass storage devices is the Unicon system, made by Precision Instrument Corp. The Unicon includes a laser that writes bits of information onto rhodium-coated polyester strips. With a trillion-bit capacity, the Unicon system equals about 10,000 reels of 800-bit tape or 4,500 9-track cards.

"Precision users that we talk to usually have a file maintenance problem," says Ed Gray, vice-president of Precision Instrument. "There are hundreds of companies which have literally tens of thousands of reels of tape. And since it isn't practical to keep this much information

"because the system has 100% redundancy, and because it exceeds the storage capacity of conventional tapes, the TBM is well suited to long-term storage," he says.

The prime prospect for a Unicon system has to be a file size of a trillion bits or one that will grow to that size in the foreseeable future, Gray believes. This Unicon prospect is changing or editing only about

"Because the system has 100% redundancy, and because it exceeds the storage capacity of conventional tapes, the TBM is well suited to long-term storage," — Manfred Wildmann, general manager of TBM storage systems

10% of his total file at any time, and he needs no information output device.

A Unicon system has been delivered to the government and is operating at the Ames Research Center, according to Precision Instrument. A spokesman at the installation said there would be no comment on the operation of the system.

One user who seriously considered both the TBM and the Unicon feels that

"The speeds of the mass storage systems seem to be best for application somewhere between batch and on-line processing," — a user.

systems are not yet ready to meet his needs. "The present stage of development, the speed and the capability to control the system were not up to using either TBM or Unicon in a random access environment," the user says.

The speeds of the mass storage systems appear to be best for applications somewhere between batch and on-line processing, according to the user. "Even if they had a random access environment, we would like to have some reliability figures from users before we make a decision," he adds.

The prospective user of a mass storage system has to look carefully at the area of

(Continued on Page 9)

User Settles on Data Cells

"Many users have been unhappy with data cell storage, but many users programmed these devices incorrectly." — Art Lemay, vice-president of Transunison.

One user with large file storage requirements sampled the specifications of the announced mass storage systems and settled for a medium that has been around for some time.

Transunison Systems Corp. stores its consumer credit information on IBM 2321 disk cells. Many users have been unhappy with data cell storage," says Art Lemay, vice-president of Transunison, "but many users programmed these devices incorrectly."

The reporting firm, which supplies local credit bureaus with consumer credit data, uses the data cells primarily in a read-only application during on-line speed. "The data cell is a slow device," Lemay conceded, "but we look at only a third of our records that we have on file. So our activity to file size ratio is unusually low."

Based on system measurement tests, Transunison is utilizing its data cells for only 17% of the total available seek time on the CPU, which is a 360/50. "We could run eight data cells without straining our available CPU channel time," Lemay says.

Before going to the 2321s, Lemay evaluated mass storage systems. The Terrabit was much too slow on sequential access speed, he says. And although the Ampex system had a large enough storage capacity, it was best suited to a batch-type application.

Grumman Mastape came closest to Transunison's "usage profile," but it also seemed a little too slow, Lemay notes.

The most promising system appeared to be Precision Instrument's Unicon, but its size was a bit overwhelming. "One Unicon could store all the credit records in the country," Lemay jokes, "but its technology looks like it would be perfect for our application in the future."

There have been some problems with the data cell but Lemay feels they have not been excessive. "It's a more temperamental system than a disk. We have had some strip crashes and service problems, but overall it has been an adequate system."

He seems to like the 2321 storage strips which are nine inches long and hold about 2,000 bytes when using full blocks. "They are a removable medium and allow us to store father and grandfather files off-line in data cell bins," he adds.

The Transunison data cells operate 14 hr/day and cost the firm about \$13,000/mo. "I estimate a Unicon system would cost about \$30,000/mo for about 20 times the storage," he adds.

The archival benefit is also pushed to a

Users Wary of Mass Storage

(Continued from Page 8)

interface once he has decided a massive memory is what he wants.

"The interface is dependent on the application," Wildmann believes. "You have to talk to the user, see what his average block size is and find out how he blocks his data."

"Both the TBM and Unicon use mini-computers as controllers," according to one prospective customer. "So you have some degree of control with a familiar device," he adds.

While using the same "building blocks," Amplex has made better strides to catch up with the others in interface that will satisfy every user. And since the goal is to interface a TBM to a user's installation "as painlessly as possible," each system may well become a custom configuration. One user who considered both TBM and Unicon systems said he would like to interface directly with 3304-type technology. This user foresees "a double or triple density 3304-type disk within two or three years at half the cost/bits of current disks."

But one mass storage marketing manager refutes this theory. "We're not going to go much further in packing density on disk than the 3330." He points out that the announced storage systems are already cheaper, a bit comparison basis that avoids disk density.

When users continue to perform mental trade-offs between systems like TBM and Unicon, some other alternatives are available.

The Orion Products Co. makes a 300 Mbit/min digital magnetic tape recorder called the Titan GW 300 that can store 25 billion bits of data. This is equivalent to about 60 reels of conventional tape and may well be the first of a new breed of "semi-massive storage" systems.

Strictly a Tape Drive

But the Titan is strictly a tape drive. Although it can operate at 600 in./sec and uses 1-in. magnetic tape, Orion has not configured the Titan into a complete

Videotape Preferred

Users who want a proven large storage system might take a look at the Amplex Videofile if they can live with a tape medium that operates primarily off-line.

Videofile accesses data, stored on videotape, via CRT displays. The system is controlled by an SEL 810 mini-computer.

The retrieval of data is initiated at a CRT keyboard where the operator enters the address of the record to be accessed. The address is entered into the mini, which in turn checks the Videofile tapes mounted on the system tape transports, and initiates a search operation to access the required record.

A Videofile could hold as many as 25 million "pages," the equivalent of 300 conventional tapes, according to Robert Miner, product manager for the system.

A system operator can "browse" through a file accessed by the mini by viewing it on the CRT display. "And the user can access his records considerably faster and a lot cheaper than a manual system," Miner says.

The system is available on lease, lease/purchase or straight purchase. Most users prefer lease arrangements, Miner believes and there are about 10 such installations operating around the country.

Videofile may not be the most exotic large storage system available, one user adds, "but at least you don't have to look too hard to find an operating system if you want to 'kick the tires'"

system. That job has been left to EG&G. And a spokesman for EG&G said that only one system using the Titan has been delivered to the Atomic Energy Commission for an application far removed from business processing.

But an EG&G engineer agrees the Titan could be incorporated into a business system somewhere between the fastest disks and the smallest mass storage systems, if some user demand develops.

Meanwhile, Grumman Data Systems thinks users can grow into a mass storage system via the modular approach it is using. As many "elements" of the Grumman system are operating in-house and the firm expects its first delivery to be made in the third quarter of this year.

Mastape differs from the other systems in its use of instrumentation tape cartridges in special cassette-shaped cartridges. These cartridges or "packs" can be interchanged to give the user modularity and mobility, according to Grumman's Roy Davies.



With a trillion-bit capacity, the Unicon systems equals about 10,000 reels of 800 bit/in. tape or 4,800 disk packs.

"By maintaining tape in smaller packs, users won't find their tapes going 'out-of-round,'" Davies says. Conventional tapes often lead to flat spots on reels that have been stored without movement for long periods, Davies says.

A "basic" Mastape system with 15.8 billion bytes of on-line storage will cost about \$350,000.

Many prospective users see very real applications for the new breed of mass

storage systems. But they are waiting to get some actual operating data from bona fide users. Perhaps the government agencies will open up the pioneer installations will give users some idea of how the large systems perform.

If not, it will probably be only a matter of time until some brave users take the plunge. Then with operating and reliability data the logjam will have been broken.

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Editorial**Now It's the Users' Turn**

While we have no evidence that IBM deliberately panicked the users and the financial people by its actions involving Data Recall, neither do we have any evidence that IBM made a reasonable effort to settle the dispute privately and without publicity.

Whether it was deliberate or not, the damage has been done. Many users and financial people are now leery of the independent suppliers because they are afraid IBM may suddenly move against them in some unexpected way.

If the users want to see prices continue to come down at the same time performance is improved, they must rely behind the independents, thus reassuring the financial backers of these companies.

There are two ways users can do this.

The safe way is to install independent equipment that duplicates IBM equipment, thus saving money and helping the independents with little danger that IBM can do anything about it.

The riskier way is to install independent equipment that offers features and performance not offered by IBM. The greater benefits may be offset by the strong possibility that IBM may retaliate in some way. But sooner or later this battle must be faced and won.

Because if IBM has its way, improved hardware and software will only be released when IBM decides it should, meaning the time when the existing IBM hardware and software has saturated the market.

And it also means that users will have to live with planned obsolescence.

At least they will until a really big "independent" — another country — gets into the act.

**Letters to the Editor****Return to U.S. Mails Or Resist Terminals?**

I read with interest your coverage of the New England Computer Users' Forum and look forward to the article by George C. O'Conor in Chicago. However, the description of Dr. Dixon Doll's keynote speech confused me.

If Doll "chided the computer terminal industry for attempting to sell the concept of distributed computing" does he mean that the user should do away with data communications and return to the use of the U.S. mails to collect and distribute data? Or was he suggesting users should return the trend toward the use of intelligent terminals to distribute processing functions?

Most users have clearly defined their use of data communications. Therefore, it seems doubtful Doll could have much effect in reversing the trend toward the increasing use of data communications to distribute processing functions. Don Beretus

Oak Park, Ill.

Doll was referring to the importance of communications services to support the distributed computing function. The terminals were available but the lines were not yet reliable, hence the concept was premature, Doll said.

103E Not 103s

Your readers should be made aware of an error in reporting what I said at the New England Computer Users' Forum. I'm referring to the March 1 article where it was stated: "A 103E system with five data sets would cost \$10,000 more than a 103E with four data sets replaced by five independently supplied multiple interface cards." A fully equipped 103E (cabinet and five data sets), and ours were, rents for \$1,075/mo. Quite a difference from the above.

If you are wondering how I came up with the \$59,000 figure,

I'm certain your readers are wondering what price we were paying for 103s to gain access to a 103E. After all, most people think of the 103A as the 103; and, as you know, they rent for \$25/mo.

What I did say was, "Last February we provided five Bell System Model 103E multiple data cabinets and associated data sets were replaced by five independently supplied multiple interface cards and five data sets."

A fully equipped 103E (cabinet and five data sets), and ours were, rents for \$1,075/mo. Quite a difference from the above.

If you are wondering how I came up with the \$59,000 figure,

the answer is five 103Es at \$74,500 less installation/purchase charges for the replacement of the 103E with four data sets.

Again, thanks for allowing me to participate in the CW Forum. It was an interesting experience.

Morton Berian

Communications Officer

MIT Cambridge, Mass.

Editor's Note

Last week we printed a photo of what was clearly a tape drive and called it "file drive" during the cartoon. We have already run the writer's little finger into the pencil sharpener as punishment, and he promises to be more careful in the future.

Making Programmers More Professional

By Dick H. Brandon

Special to Computerworld
I am often asked if being "professional" is an association to which I usually respond that some of my best friends are programmers. In fact, nothing could be further from the truth: some of the best years of my life were spent as a programmer, on the IBM 705, 650, 1410, etc.

I do believe, however, that programmers need to become more professional, and need to establish a programming discipline and a working ethic — totally separate and distinct from systems analysts. If this is not done by the industry, on an industry-wide basis, the result will be a continued decline of the programmer, inevitably resulting in militant unionism.

The signs are all there. There is unemployment among programmers for the first time. There is increasing emphasis on and understanding of the "user" function, thereby further reducing the need for programmers.

Programmers are exhorted to become analysts, and career paths are designed with analysts as an end point. Those who are not programmers will not qualify for analysis, or will be unhappy in performing the tasks of analysis. Many data processing people (inaccurately) refer to themselves as "users" and further contribute to a sense of inferiority.

One does not counteract this simply by escaping into systems analysis, especially if the escape

won't work. The proper attitude is to embrace the programming profession — to provide the appropriate professionalism and a meaningful career path for programmers.

The first step is to clearly define the programming function, to clearly separate it from systems analysis, and to define the inter-

Viewpoint

face. This is mandatory, if we are to have a professional function. It is first step in establishing a clear identity for the programmer, and in giving him a sense of belonging. It is also necessary to eliminate the myth that one person can successfully do both systems analysis and programming.

Other primary reasons for the separation are:

- The fact that totally different skills and prerequisite characteristics are required for the two jobs.
- The extensive and different training needs of each job, which make it impractical to teach one person both skills.
- The fact that the job represents a basic conflict of interest — in that the analyst must optimize the user's needs whereas the programmer is concerned with machine optimization.
- Basic common sense which suggests that a person doing coding or testing is worth less than one doing design or communicating with line management.
- The enforcement of documentation, as a principal means

of communication between the two functions.

It is clearly possible to separate the two functions, clearly and without controversy. The analyst works at the systems level, and the programmer at the application level, including the mathematical, feasibility, analysis, data analysis, design and specification development.

Similarly, the programmer starts at the point where the analyst ends, dividing into its most logical elements: programs. He is then responsible, for each program, for logical analysis, coding, test planning, testing and documentation.

Upon completion of all the programs, the analyst and the programmer both participate in systems integration.

The tasks ahead are clear, assuming we separate the two functions in our industry, and further assuming that some organization is willing to assume responsibility. We must:

- Define the scope of systems programming.
- Define the tasks of each function.
- Define the point of interface.
- Establish standards for the communication between the functions.
- Establish a uniform methodology and a discipline for each.
- Define separate career paths and promotion goals.
- Establish the necessary ethics for each.
- Disseminate the results to the professions.

Brandon is president of Brandon Applied Systems, Inc., New York.



Let's Not Dismember IBM, But...

Let's Stop Scalpel-Makers From Teaching Surgery

At the beginning of this year I wrote that my style was changing, because the data processing profession was changing. I said I would not put quite so much sugar on my comments — I would be more forthright.

Later in January in Cleveland at one of the most delightful DMA meetings I have attended I was asked about this comment, and I asked whether it meant I believed the profession was becoming untiring, and even more, how mature I believed it was.

It was an excellent question, and one that I would like to thank my unknown questioner for. I answered that I did believe we were maturing, and that I estimated that we have now achieved the status of a teenager who had sufficient intelligence to have learned to take care of himself, but who was not yet sufficiently stable to take full responsibility.

In that busy evening there was no opportunity for me to expand the answer to cover the next question which would undoubtedly have followed. The question: why did I feel the profession was not yet mature, what evidence did I have for it, and what had to be done to move to maturity? These are some of the most important questions

functionally the same, you first asked him his opinions — you practically asked his permission!

The dependency was one of pure dependency.

Criticism at this time had to be raised rather carefully. As is the tradition during the reigns of priests, popes, or kings by divine right, the criticism came from the people who held the jokes of the court jesters. So it has been here. There were a few of us jesters around.

But now matters have changed. Now we can ask the computer manufacturers are open to question, because we have noticed there are other hardware manufacturers who can apparently supply the same peripheral systems. So the absolute division has given way to big manufacturers. We still respect them, we learn from them, we use them, but there is not quite the same awe as there used to be.

This is why I believe we have matured.

Failure to Protect Employees

But at the same time the profession has grievously failed. We have, for instance, a major manufacturer who has apparently lied to the people for whom we run these million dollar toys and for whom we provide programs. We have failed them, and that is a fact.

We have failed because we have not sufficiently warned them of the dangers involved in the use of computers. They have come to us and asked: "Is it feasible to use a computer for such and such a function?" and we simply answered yes.

We have not answered, "Yes, it

functions well, but you must be very careful with it." This is news which can only be properly understood within the profession, but which people in the labor movement and the public must be made aware of urgently.

We are in the profession have had this knowledge available, and we have suppressed it, carrying on without keeping the society informed. This is why I do not believe we are more mature than before.

How then can we improve our maturity? Here we have to look to find the cause of our lack of maturity. We know it is not lack of knowledge, it is lack of aggressiveness, for I find a great willingness among the profession to look at new problems when there is a reasonable chance the resources will be available to solve them. The simple fact is that the resources have not been available (or at least we have not believed that they are available) to study questions that might have previously involved us in professional liability.

In January this year one of our major EDPA educators, Thomas Cashman Jr., started a newsletter with the question, "Data Processing Education — A Decade of Failure?"

I think he hit it on the head. Our professional problem has been the lack of leadership in the educational and academic fields.

In many cases it has been found that the only way the academic world could get the information they wanted for their own research was to keep it secret, either by excluding other members of the profession (as was done in microprogramming) or by having it classified as national security. It became possible that some embarrassment might occur (as was done with a user group/IBM study which revealed that superhuman computers may be in large-scale use in our factories in 1980, and that the in-

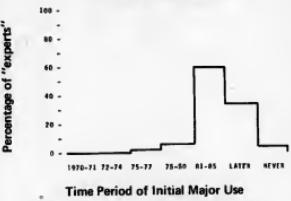
dustry was planning to obtain tax advantages so as to lessen the cost!) each figure.

The academic community has failed to set out that our justification studies should bring out the dangers involved in data pro-

ductivity without destroying ourselves and the golden goose?

It is to be hoped that in the future the challenge of the real study of data processing will attract the adventurous in ac-

Automated Robots



Features: Eye-like sensors, tax incentives for automation

This figure, taken from the 1970 IBM/Guide Report, shows that the computer "experts" expect robots to be in use in less than a decade. The report tax indicates these will have "superhuman" capabilities, and be used to replace human workers. The legend notes that tax advantages to assist in this movement are contemplated. The computer industry appears to prefer to keep the matter secret, rather than reveal the problem in time for proper discussions. Do you think the workers whom the superhuman robots will replace agree? Or the taxpayers who have to consider the costs of unemployment?

demics/education, and that they will, perhaps as a byproduct, perhaps as a catalyst, set up for education centers which will be mainly medical schools instead of barbershops, and which will then allow the rest of the profession to perform its duty both to its employer and to the society.

For this is where the key to our continued development lies, not in the dismemberment of IBM as such, as Joan Van Horn and Telex Corp. want, but instead in the realization of the changes involved in entrusting the education to these manufacturers.

We should realize perhaps that the complaints such as those put forward by the International Bankers and the International Computer Workers Association (ICW, Jan. 26), might not have taken place if we had previously received education from the manufacturers' control. This is where the primary danger to the profession lies.

Hopefully we will soon get our medical school, and put the scalpel-makers in their place.

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Performance Improvement Ratio

Without Hardware Changes

This figure, taken from Husson's "Microprogramming, Principles & Practices," 1970, Practice 10, proves that before the 370 was invented, we could make performance improvements were possible without any hardware changes — and that in fact the systems IBM offered in both the 360 and 370 Series were being kept down to 10% of the real hardware capacity in table searching. This was general knowledge in some academic circles for years — but the users were left in ignorance of the capabilities of their hardware. I wonder whether the people who paid for the system would approve?

before us, and I think they are now worth discussing.

Death of Divinity

The major change in the past two years has been the end of the reign of the big computer manufacturers, the priests of the data processing religion.

As recently as two years ago it was hard to question the words of the local friendly salesman (except occasionally when you might consider wandering from one religion to another). The salesman was the fountain of knowledge. He could, on occasion, make you afraid that merely asking questions could hurt your career. If you felt like replacing some of his equipment with someone else's that was

is feasible, but because the manufacturers did not warrant their hardware, and because of hundreds of flaws in the software, and because of the time it takes us to change anything, there are dangers which may well outweigh the advantages of doing so.

As many recommendations and justifications of computer systems have you seen that have really spelled out in terms management can understand just what might happen, and what the effect on the organization might be few.

And we have failed to see that the equipment with which we are supplied is used to its fullest. Here the failure is not so much in the installation, but in those

	Model 40	Model 50	Model 65
Matrix multiplication	1.47	1.59	1.49
Polynomial evaluation	1.64	1.45	1.34
Table search	11.8	13.8	10.0
Byte test	10.8	6.2	5.0

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Obstacles in Indonesia

How About a Computer Lost at Sea!

By Barbara Pantel

Special to Computerworld

DJKARTA, Indonesia — From the edge of the jungle in East Kalimantan to the borders of the formidable Atjeh tribes in North Sumatra, computers are part of the daily business for Pertamina, the national oil company of Indonesia.

Indonesia has special characteristics of geographic communications and culture which make computer processing an invaluable tool for growth, and Pertamina is leading the way in using the computer as a tool, though it is not by any means the only user.

But there are many obstacles to such an operation as simple things as telephone calls cannot be taken for granted. Downtime is a big hazard when there are no communications. And what about the implications of a computer lost at sea, as was the case when North Sumatra's 360 was ordered from West Germany, arrived on time in Singapore, but was misplaced "somewhere at sea"

for months afterwards. When it finally arrived in North Sumatra, it turned out to be a 64K system rather than the 32K ordered. Company officials were too relieved to give much thought to the possibility that some other company might have a 32K instead of a 64K.

Complicated Schedules

The daily business includes a refinery system that schedules production from crude oil produced locally or around the world; an inventory system with so many items as table locks; and current codes are used for postings to ledgers; an inventory system with three-year delivery dates that are not uncommon; a personnel system that keeps track of more than 40,000 employees and 200,000 or so dependents; and a medical system that watches the health of the workers.

Pertamina is just a company, but a community. The data processing systems up and running and in planning reflect the size, scope and importance of one of the largest income-producing activities in Indonesia.

IBM Training Course

Pertamina's DP coordinator, Ed Soenrodi used his Master's degree in business administration from the University of Indonesia and an intensive IBM training course in the U.S. to build a formidable computer operation. He started in 1966 when the first computer, a 1401, was installed in North Sumatra, and continued in 1968 with 360/30s replacing tab systems taken over from Shell Oil Co. by Pertamina during the Sukarno regime.

Pertamina has a main computer center in downtown Djakarta and three centers in far-flung areas of Java, Sumatra, South Sumatra and in Kalimantan. The headquarters computer system includes a 128K 360/40 with 2314 disks and four tapes.

The outlying units have standard configurations: 360/30s with 32K, 2311 disks and four tapes each. These computer centers are not hooked up to each other yet, but remote terminal processing and computer communications are planned. Pertamina has trained more than 25 programmers so far in a program that is just now getting off the start line.

Two applications — financial accounting and inventory management — are standardized in all computer centers. Someday all company-wide applications will be standardized, but it is a slow process.

Many of Pertamina's original operations originated in the days of oil companies. When they were absorbed into the Pertamina family, the personnel and procedures of the original companies were taken over intact.

Complex Whole

It is not just coincidence that DP is an important part of this process. Soenrodi was backed up by an enlightened management which saw the possibilities and seized the opportunity to use computers as an integral part of the greater task of forming one company out of the many parts.

Dr. Ibu Sutowo, Pertamina's president, should be credited for supporting his DP staff at a time when the idea of placing computers in jungle-bordered oil fields was considered a pipe dream.

IBM has been maintaining Pertamina's computers and helping personnel and equipment keep up-to-date with Soenrodi's forward-looking applications and requirements.

One example of the progress being made is that the computer is soon going to work on a central logistics management system. A central logistics management system is expected to isolate lagging supply actions from the thousands that are processed every day. Pertamina's logistics management system will be the most modern in the country and probably in the region.

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Consortium Members Meet On Common DP Problems

MONTERRAY, Calif. — One hundred and fifty institutions of higher education will have the opportunity to share their experiences and theories on common DP-related problems — from use of CPM to administrative functions of the manager of computer science — at the annual meeting of the California Educational Computing Consortium (Cecoc) next month.

The work of the two-year-old organization, which can be joined by seven special interest groups, each of which conducts seminars and workshops related to particular areas.

Thus far, the consortium does not have any hardware of its own, and members are encouraged to utilize their own equipment.

In a recent meeting, Cecoc mem-

bers examined the "articulation" or coordination of curricula between the state's junior colleges, four-year colleges and universities.

DP courses in the junior col-

leges have traditionally been

considered vocational education,

Education

but the expanding interest in "computer science" by the four year schools is forcing a reappraisal of that aim, according to El Camino College's Robert J. Fredrick, who chairs the Cecoc interest group on teaching of computer science.

Prison Has 1130 For DP Training

YARDVILLE, N.J. — Inmates are learning RPG, Fortran and Cobol, and unit record and console operation at the York Prisoner and Community Center here. The "hands-on" training program uses the center's IBM 1130 and related equipment and lasts 48 weeks, divided into three phases. Thirty inmates were trained in the first year of the training, and 40 are in the current class.

Since the project's success depends on acceptance of the center's "graduates" by the business community, firms interested in interviewing emerging trainees should contact the center's DP instructor, Samuel Russell, through P.O. Box 1, 08620.

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Microprogram Seminars Set

SANTA ANA, Calif. — Micro-programming has become an active system tool as well as a means of implementing software on a CPU. As part of the changeable Microdata Corp. is conducting a series of no-cost seminars for systems and programming groups in various cities.

Feasibility, design, programming, implementation of micro-programming systems will be covered, and each seminar will include equipment demonstrations, discussions, slide presentations and lectures.

The next seminars will be in Minneapolis on April 25-26; in Philadelphia on May 23-24; and in New York on June 27-28. Further information is available from the company, at 644 East Young St., 92705.

Film List Ready

NORTHFIELD, Vt. — A revised *Directory of Films for Data Educators* has been compiled by Arthur B. H. of Norwich University, and published by the Society of Data Educators. The directory contains detailed descriptions of 350 files, sources where they can be rented or purchased, rental fees and the running times.

The directory may be obtained for \$2.25 from the society, 2-76 Union, 05663.

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varian data machines 



March 22, 1972

Page 15

Random Notes**Enhanced Booth Spoiler Cuts Processing Time 30%**

THOUSAND OAKS, Calif. — A new version of the Spoiler package from Booth Resources International takes 6K bytes of core but increases processing throughput by 30% over the older 4K version, according to the company.

The new Spoiler operates in foreground parallel under DOS/360 and requires 20 to 30 cylinders of direct access space in addition to core. Control functions modify the first in/first out logic of the \$4,000 package, a Booth spokesman said from 15432 Ventura Blvd., 91403.

New "Super/Pay" Uses 48K Core, Runs on Lines of Mainframes

LOS ANGELES Version 2 of the Super/Pay payroll-personnel system from California Database operates in a 48K environment on IBM, Honeywell, RCA or Burroughs mainframes, the company said.

The system is said to be less complex than the original Super/Pay, which supported 30 earnings and deductions categories, five state and local and two federal tax segments, but took 80K bytes of core. Version 2 can be used by multiple users with up to 100 "profiles," and sells for \$990, from 6430 Sunset Blvd., 90028. Receivables Processed by NCR

DAYTON, Ohio — Users with fully committed in-house CPUs can still have their customer accounting under DP control with the Open Item Accounts Receivable System, now available at NCR dealers nationwide. Virtually any type of input, including optical-print paper tape, punched paper tape, punched cards or magnetic tape, can be used. The service generates monthly customer statements and a range of management reports. Processing times depend upon volume and types of reports desired, subject to a \$150/mo minimum.

Canadians Use Nutrition Package

RENDALE, Ontario — Producers of animal feedstuffs can optimize feed formulation costs and ingredients usage with the Nutrition Management Service program implemented on the Com-Share Ltd. time-sharing network. The program was developed by Murphy Associates Inc., of St. Louis, Mo., and are available on local dial-up lines in most major cities in Ontario and Quebec. Com-Share said from 41 Voyager Court North.

Newsletter Tells How**DP Project Pitfalls Can Be Avoided**

By Don Levitt
of the cw staff

CAMBRIDGE, Mass. — If management is alert, early in a software development project, to the dangers signs can be recognized and corrective action taken in time to save the project, according to ADL Systems Inc.

In a newsletter to senior executives, the firm warned its readers to be wary of:

- The slippery specification.
- Excessive confidence.
- Too many changes.
- The last-minute test plan.
- The "lack of resources" excuse.

While almost every project starts with a set of specifications, too many users break the development into minute steps, each of which may include design changes from the prior step, the author said.

A performance test is a plan system drivers in major steps, during which design changes are fixed. Important changes or additions can be accumulated in parallel with the work effort, the author said, and designed into successive stages after each milestone is reached.

Project managers must be fully knowledgeable in the details of the

job to be done, with sufficient authority to get it done, the author said.

Although most software developers have a good idea of what the later phases of a project are too late in terms of discovering the little problems that cause delays and overruns. Instead, users should provide adequate time, progressive documentation and defined standards for testing each component of work as it is

completed, he added.

Lack of computer time to test programs and experience with file structures, diagnostic and other programming techniques wastes time and money, and for little reason, he said.

The newsletter, called *The Casebook, Finishing the Software Job*, is distributed without cost by ADL Systems Inc., Acorn Park, 02140.

'Problem-Oriented Languages' Put Programming in User Terms

WALTHAM, Mass. — Users can write programs in terms they understand and without the artificial restraints of conventional languages, with Problem Oriented Languages (POLs), from Computer Softech Inc.

In most cases, POLs will be simple command-type processors which let the non-programmer work comfortably with the computer, but they can be source program generators, interpreters or macroprocessors for the more experienced user, Softech said.

Whenever possible, the POL will be

created from pretested modules which control both the time and quality of the production process. This means that few POLs will take more than six months to develop.

POLs are built on the assumption that they will be modified or enhanced to meet changing user needs.

Softech will generally use PL/I, Cobol, Fortran or Pascal as the language to create POLs. The choice of program implementation language is transparent to the POL user, the company said.

Diagnostic and debugging capabilities will vary with the type of POL.

Once modules are developed that meet the particular needs of an industry, however, POLs for that industry should be available for about \$4,000, and completed tailored POLs, based on the available modules, might cost no more than \$8,000, a Softech official estimated.

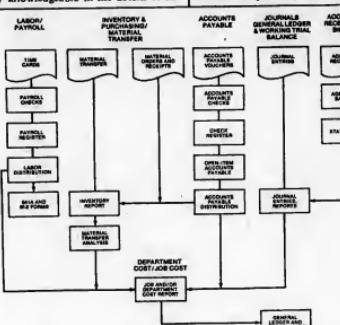
The company at 391 Totten Pond Road, 02154.

NIH Funds Support Statistical Package

RALEIGH, N.C. — A major of the statistical analysis and procedures used in the statistical analysis of data are included in the Statistical Analysis System (SAS) developed at North Carolina State University, under a grant from the National Institutes of Health.

The present version of SAS is described as a general purpose language consisting of data input statements, transformation statements, subsetting operations and linkages to handle the analytical procedures.

SAS runs on IBM 360/370 CPUs operating under OS and having at least 150K bytes of main memory. Each release is available to universities and other public service institutions for \$35, and to commercial users for \$100, from the Institute of Statistics, P.O. Box 5457, 27607.

**Business Applications Linked**

Businessmen can have flexible but effective controls with the General Business System (GBS) software on the Boeing Computer Services (BCS) network. The system provides interfaces so applications can be run separately or in combination with one another. Thirty-two management reports provide a broad range of support. BCS can be reached through P.O. Box 708, Dover, N.J., 07801.

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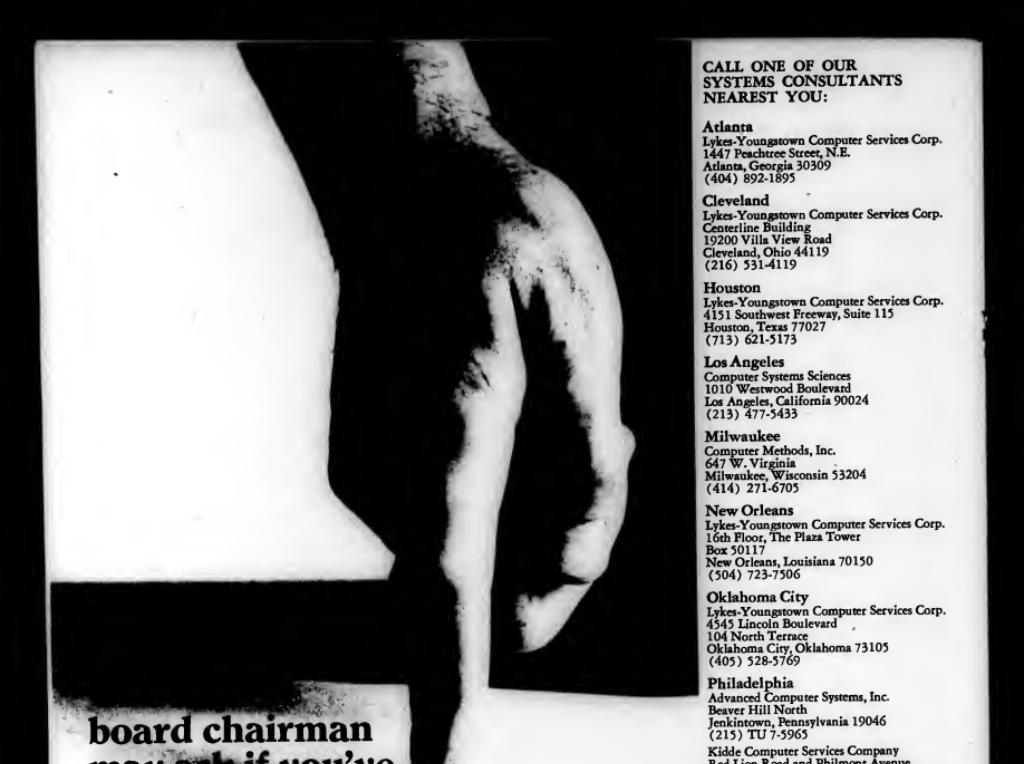


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What about durability? Good question. Even though our new BASF/2000A.D. coating is thinner, it's also harder than conventional coatings. And less abrasive. Result: less head wear, longer tape life, greater longtime reliability.

And finally: our new BASF/2000A.D. base is a premium polyester, tensileized in both directions. Edges are the cleanest in the industry, cut to a tolerance of $\pm .001"$ (vs the industry standard of $\pm .002"$). We QC every

step, from milling to packing. And we certify every tape.

There's one thing we don't do to our latest tape: We don't sacrifice any of the push for perfection that has always characterized our previous tapes. BASF/2000A.D., in other words, is quality added on — not a trade-off.

As you can see, a tough way to make computer tapes. But you can see something else, too: it can sure make life easier for you. Why not write for more details?

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Here is what this means for you.

- The scheduling function will be less complicated since the number of devices is the major concern rather than the physical unit assigned.
- Partition switchability would result without the need for changing job control statements.

- The operations manager will experience greater flexibility in adjusting the schedule to meet adverse situations.
- Operation intervention will be eliminated whenever an I/O conflict is encountered.
- The operator will not have to be concerned with remembering the devices that he has reassigned.*
- Because of efficiencies through the utilization of dos-allocate, elimination of one or more peripheral units may be realized.

You can add more benefits to the above by trying dos-allocate on your system—free. If you are not completely satisfied—there is no liability. We are confident that you will find it to be more than you expected.

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March 22, 1972

Bits and Pieces**Print System Connects Drives, Printer to Nova**

MAYWOOD, N.J. — Ultimaco Systems, Inc., has developed an off-line printing system, based on its Ultimaco 514 controller, to connect one to four 2314-type disk drives and a line printer to a Digital General Nova.

The system, with a 24K byte memory, is compatible with IBM DOS software. It features automatic fail-safe record addressing, hardware error checking and a variable record length of up to 32 bytes.

The system includes a 24K byte Nova 1200, either a 300 or 600 line/min Mohawk printer, 2314-compatible Century disk controllers and software and is priced at \$59,750. Ultimaco's 514 controller is \$1,200. Third-party leases are available, with a 60-month lease priced at \$1,200/mo. Delivery is 90 days from 9 Brook Ave., 07607.

Teletype Terminals Connected To Data Sets With Interface

VERONA, N.J. — The EIA Interface Coupler Model D-720 from Universal Technology, Inc. allows the interconnection of Teletype terminals to data sets conforming to EIA standards. The D-720 couples teleprinting equipment to 103A, 103B, 103C, or 103F Bell data sets or equivalents.

The EIA interface unit accepts data from a serial generator, a teletype terminal and converts these to bipolar signals for use by the data set. Bipolar signals from the data set are converted to current/no-current signals of 20 mA or 60 mA for use by the teletypewriter. The device also controls signals for the data set and converts on/off and off conditions to signals for driving control devices.

The interface is priced at \$99. It is available from stock from 29 Commerce St., 07044.

Tape Gauges Check Alignment

HUNTINGTON, N.Y. — A line of perforated tape gauges from Computer Accessories Corp. is designed to check the accuracy and position accuracy of each tape.

The hand-held gauge checks the alignment and position of five sprocket hole pins. Double rows of data holes are used to check the position accuracy of each tape.

The 105, priced at \$9.95, is used for five-level tape. The 108 for eight-level tape is \$12.95. For advance feed teletypewriters, the 106A is priced at \$14.95. The 105M, \$32, is a test tape master for five-level tape. All models are available from stock from 211 New York Ave., 11743.

3M Introduces Packs With Locks

ST. PAUL, Minn. — A locking security device has been added to the Scotch brand 911 disk pack product line as an optional feature by the 3M Co.

The Scotch "Lock Pack" design is a lock and key system that prevents unauthorized use of a disk pack which contains valuable or confidential information such as company payroll records, 3M code.

Only by using the key to unlock the pack can it be put into the computer. The disk pack is optional. "Lock Pack" feature is available on purchased disk packs only. List price of a Scotch 911 disk pack with the "Lock Pack" device is \$295, according to the company.

Communications Stressed on NCR 399

By Frank Piatta

of the CW staff

DAYTON, Ohio — NCR has come a step closer to erasing the distinction between its accounting machines and computer systems with the NCR 399 Series.

The new machine can be used either as an independent data processing system or as a peripheral to a larger computer. In addition, it has the same capabilities in the 399 edition if it is linked together scattered offices or plant DP operations.

The 399 is built around NCR's small 605 computer with a cycle time of 1.2 μ sec. Operations that involve no memory access are accomplished in .6 μ sec. Memory is available from 8K to 16K bytes in increments of 2K bytes. I/O data is handled in parallel allowing peripheral operations to be overlapped. Automatic data transfer is implemented.

The instruction set uses high-level language that minimizes the number of commands needed, NCR said.

Magnetic tape cassettes are the principal means of data storage, and are supplemented by magnetic ledger cards and a keyboard. The cassette system can handle data at 750 char/sec and can be used for data entry as well as storage. The ledger card handling capability is increased by a higher capacity card that provides up to three times as much storage as previously available in NCR systems.

NCR indicated that additional peripherals, such as paper tape and punched card equipment will be available soon.



Tape cassettes provide high-speed loading for the NCR 399.

Control lights constantly indicate what is occurring and the system can be programmed to flash printed messages on its control panel to guide operators.

Communications capability include both synchronous and asynchronous communication with either Bell or NCR modems, in batch or conversational mode.

The NCR 399 costs \$14,000 in its basic configuration. Lease prices start at \$420/mo. First deliveries are scheduled for the fall of 1972, NCR said.

DG Introduces Five Nova Systems for Education

SOUTHBORO, Mass. — Data General has introduced six general purpose systems, five in secondary schools, junior colleges and universities, and one for military control tape preparation.

The educational systems are designed around Basic and range from a single-user tape-top system to a multi-user, program-swapping system that can handle up to 16 simultaneous users.

The Seminar 1 is priced at \$8,500 and includes an 8K Nova 1220 mini and a teletypewriter.

The Seminar 2, a single-user system that includes a moving-head disk with a capacity of 1.2M words, is built around a 16K Nova 1220 and teletypewriter. It is priced at \$24,475.

The Seminar 3 time-sharing system for up to four users includes a 16K Nova 1220, console teletypewriter and four terminal teletypewriters. A system interface to allow expansion of up to 16

terminals is included in the \$21,025 price. An expanded version of the Seminar 3, the Seminar 4, includes a 1.2M word disk and a 20K Nova 1220, console and four terminal teletypewriters. It is priced at \$35,875.

The largest system, the Seminar 5, includes both a 25K fixed head disk and a 1.2M tape moving head disk. Intended for up to 16 users, it includes a 24K Nova 800 Jumbo computer and five teletype-

writers, costing \$50,975.

In addition to the mini, the system includes a teletypewriter console and a full set of geometric, pattern supervisory and editing commands. It is priced at \$5,950. The addition of twelve memory modules raises the cost to \$7,450. A post-processor for any machine tool costs \$1,000. First shipments are scheduled for this spring.

'Mark Tape' Holds Source Data

PASADENA, Calif. — Bell & Howell's Mark-Tape data system stores and retrieves source data on computer-compatible magnetic tape, has been introduced by the company's Electronics & Instruments Group.

The system includes a Mark Document Reader, a digital tape recorder and the necessary interconnecting cabling.

The Mark-Tape system reads pencil-lead handwritten and printed data. Marked data is optically read, translated and written on 7- or 9-channel tape.

The Mark-Tape data collection system can be delivered in 30 days or less. Prices range from \$9,300 to \$11,000 depending on the model. Lease rates range from \$319 to \$396 a month.

CRT Gains Controller, Fuller Character Set

NATICK, Mass. — Natick has added a peripheral I/O controller, an expanded character set and new text-editing features to its SPS 10/20 intelligent CRT terminal.

The "Party Line Controller" operates without modems to speed up data exchange. The controller is designed to cluster CRTs at speeds up to 9,600 bits/sec on two-wire lines.

Upper/lower case and 96-character ASCII compatibility are provided along with other characters used by EBCDIC and BCD codes.

The purchase price of the expanded character set and text-editing feature is \$2,000. Rental price is \$12/mo.

The party line controller costs \$440 or rents for \$20/mo. Modem costs \$5/mo. The controller is available on a 90-day delivery schedule from 6 Strathmore Road, 01760.

DEC PDP-8 Series Grows Again

MAYNARD, Mass. — The latest member of the DEC PDP-8 family of minicomputers, the PDP-8/F, is a general-purpose unit intended for end-user applications.

With up to 16K words of memory, the PDP-8/F includes the CPU, programmer's panel and power supply.

The PDP-8/F is similar to a single Omnibus, resulting in streamlined packaging and reduced power supply requirements, according to DEC.

The price of \$3,990 for the 4K model includes a 90-day warranty, installation, two weeks of training and documentation. Deliveries will begin in April.

COM Instant Microfilm

None of the 360 and 370 computers we've seen is smart enough to tell the difference between a 1443 or 1403 printer and the Quantor 100N microfilm recorder/processor. They wonder why the print output jumps to 10,000 lines a minute. Under \$30,000 with software.

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Computer Users' Forum & Exposition

The Need

The computer age is moving into a new stage. Until now, computer makers have dominated the scene, introducing one breakthrough after another in the state of the art. The time has come to pause and consider the computer user. You need more opportunity to improve on the systems you now have.

The Solution

A Computer Users' Forum, run by professionals and designed to bring regional users together in manageable groups to discuss mutual EDP problems with other users, and with regional and national experts . . . and a chance to study and evaluate new equipment and services that will be shown in the presentations of leading EDP suppliers comprising the Exposition.

The Format

Each Day 9:00-9:40 Keynote address by a nationally known expert – an independent, not a vendor – on the day's main subject. Sets the stage for discussions.

9:40-10:30 Panel discussion led by regional experts chosen for their progressive management principles. Questions encouraged.

10:40-11:45 Workshops – panel members conduct separate workshops. Your specific questions fielded, worked out.

12:15-1:30 Conference luncheon – keynote speaker summarizes chief points covered during panels and workshops.

1:00-7:30 Exhibits open, stay open 'til 7:30. Exhibitors will show the latest in hardware, software, services.

The Subjects

First Day: Data Entry

Keynote speaker: Lawrence Feidelman, President, Management Information Corp., Cherry Hill, N.J.; Editor, *Data Entry Today*.

Panels and workshops will be grouped by these four subjects:

- Keypunch replacement; key to tape, disc and cassette devices.
- OCR.
- Intelligent terminals – distributed processing.
- Direct data entry/source data automation.

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Second Day: Data Communications: The Choices

Keynote speaker: Dr. Dixon Doll, Data Communications Consultant, faculty member, Graduate School of Business, Eastern Michigan University.

Panels and workshops will be grouped by these four subjects:

- Communications equipment from mainframe makers and common carriers.
- Communications equipment from independent suppliers.
- Data transmission via private (lines, microwave) networks.
- Data transmission via carriers (lines, microwave).

Third Day: Operational Efficiency

Keynote speaker: Charles Lecht, President, Advanced Computer Techniques, N.Y., N.Y., author of *The Management of Computer Programming Projects*.

Panels and workshops will be grouped by these four subjects:

- Core extensions.
- System/utility software modifications.
- Independent peripheral usage.
- Dedicated systems vs. general purpose computers.

Panel Members & Workshop Leaders

The regional experts who will run the panels and workshops have been chosen from a wide range of firms and institutions. Some will participate in more than one session, depending on their experience and expertise.

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- 06 Finance/Insurance/Real Estate
- 07 DP Serv/Bureau/Statistical/Pinn.
- 08 Educational/Medical/Legal
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- 11 Communications/Printing/Publ.
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YOUR FUNCTION

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*Monday-Wednesday Schedule

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- OPERATIONAL EFFICIENCY – Day Three; EXPOSITION ONLY

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Line Problems Cited

Study Vindicates Terminal Equipment

By Ronald A. Frank
Of the CW Staff

MAHWAH, N.J. — About half of the troubles reported by teletypewriter users are caused by carrier-connected line equipment and not terminal equipment. Only 5% of reported problems can be traced to operator error.

These statistics are part of a study by Western Union Data Services which highlights the firm's new Terminal Equipment program. Data Services is a non-regulated subsidiary of Western Union and the study covered about 5,000 Model 33 and 35 TTYs which were installed by the company's "Gong" inter-connected equipment.

The teletypewriters studied included installations with both Bell Data Access Arrangements (DAA) and external couplers, according to a spokesman.

Out of 3,800 calls received at the Termerica center during one sample month in 1971, more than 600 were classified as "no trouble found." Included in this category was the number of calls to send a message without completing the call; in many cases a busy or other temporary line.

Comdata Shows 330s

NILES, Ill. — Comdata Corp. has introduced the 330 Series of modems to replace 103 and 113 data sets.

The 330 can provide up to 16 modems in one cabinet, together with a display panel indicating the status of control and data functions. The 330 Series interfaces with both CBT and CBS Data Access Arrangements for automatic answer applications.

The 330 cabinet is priced at \$465 with display panel. Each modem costs \$195. The 16-line-to-one-terminal power system on a lease-with-purchase option costs about \$88 per month. The 330 is available from stock. Comdata is at 7544 W. Oakton St., 60648.

problem had been eliminated by the time a service representative contacted the user, a Data Services spokesman said.

Under the Termerica maintenance program, trouble calls are sent to the Data Services Mahwah headquarters via 30 toll-free West lines. After check-

Communications

ing available trouble records on the user's terminal, maintenance analysts contact the user to pinpoint the cause of the problem. In most cases, the problem is solved by "talking" to the customer via his teletypewriter. For more serious problems a ser-

vice representative is sent to the user's installation.

With the sample month, the second largest type of trouble call was caused by modem problems. Of the 1,200 calls, some had built-in modems and others had externally-added modems, a spokesman said. About 240 of the calls for the month were classified as caused by coupling devices, such as a break-down of house lines due to DAs or acoustic couplers was not available.

Among the trouble reports traced to the terminals, about 500 were related to power problems. A large amount, about 150, was due to keyboard malfunctions or paper tape problems.

SCS Staff Hits Rochester Rates

ALBANY, N.Y. — Customer-provided equipment should be interconnected with the facilities of the Rochester Telephone Corp. "as the same rates" now applicable to other services.

This is one of the recommendations made to the New York Public Service Commission (PSC) by its staff after extensive hearings. The staff recommendations are subject to final approval by the commission.

The proposal of Rochester Telephone was first filed early in 1971, and would interconnect data and other users via a Network Protective Device (NPD) which is simpler than a Data Access Arrangement (DAA) required by Bell System companies.

Included in the PSC recommendation is a certification program that would require third-party provided devices connected to Rochester Telephone lines. Business users would be subject to two certification inspections per year to assure that their equipment

meets telephone company specifications.

Rochester Telephone, an independent company outside the Bell System, had proposed a separate higher rate classification and maintained equipment" (Coame). But the staff found that a higher rate for Coame users, based on what Rochester claimed would be potential loss of business, was justified.

While most users were pleased with the PSC staff recommendation, some had specific reservations on implementing parts of the Rochester Coame service, if approved.

"If I give the Rochester phone company a piece of equipment to certify, what would it cost and how soon would I get an answer?" one large user asked.

Another user asked, "Will New York Telephone Co. will interconnect Rochester Coame users with the rest of the Bell network?"

The PSC says that Rochester Telephone can use its NPD without harm. It will be tough for the Bell System to object, one data user said.

Bell Working On New Rates

NEW YORK — The Bell System is working on an "entirely new rate schedule" for private line services. The new rates will be introduced as a nationwide basis as soon as "market and competitive" is completed.

The new rates, which will relate directly to the costs involved," were discussed by AT&T chairman H.I. Romnes in the carrier's annual report to stockholders.

Citing AT&T's past policy of setting private line rates "the same for like distances everywhere in the country," Romnes said, "it may not longer be viable" in light of the recent FCC order allowing specialized carriers to compete with AT&T.

The Bell System is engaged in a "restructuring of rates generally," Romnes added. "Now it seems fair to ask customers to take on a more realistic share of costs [that they incur]," the AT&T chief added.

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Aussies Update Probation Data

Special to Computerworld
SYDNEY, Australia — Judges and magistrates in New South Wales will soon be using computers to keep track of offenders, but only to provide feedback on previous sentences made.

The computers will decide whether the offender will respond to probation, its chances of rehabilitation and whether the punishment should be harsh or sympathetic.

The computer will store information on offenders' behavior patterns, social background, drinking habits, associates, attitudes toward employment and fellow-workers and attitudes toward probation officers.

The system is expected to let New South Wales draw up prediction scales for crime.

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Computer Industry

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March 22, 1972

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CI Notes

Rel Drops Office Unit

SAN FRANCISCO — Itel is phasing out its office products line which has been a "strain on the company" and is selling off one of its disk drive subsidiaries.

Phasing out the office products line will result in a loss for the year of about \$6 million, the firm said, while the sale of Diablo Systems Inc. to Xerox will be for stock valued at around \$29 million.

Itel still owns another disk drive maker — Information Storage Systems.

Government Supports CAI

WASHINGTON, D.C. — The National Science Foundation has allocated approximately \$15 million for the support of a four and a half year program to test the effectiveness of computer-assisted instruction systems.

The money will initially go to Mitre Corp. and the University of Illinois and will involve a test of the systems with approximately 2,500 students.

Manitoba Starts Service Bureau

WINNIPEG, Manitoba — The Manitoba government is entering the computer industry, with plans to sell available time on its recently purchased second-hand CDC 6600 to private firms. The computer primarily will be used to handle workloads of government agencies such as the Manitoba Public Auto Insurance Corp. and the Manitoba Development Corp. (MDC), noted Premier Ed Schreyer.

Initially, officials of MDC, the province's industrial development agency, considered forming a corporation to compete with private service bureaus by offering lower rates, but it was easier to approach other firms and political parties forcing the government to offer competitive rates.

Supershorts

Computer Machinery Corp. has signed a distributorship agreement with Nissho Iwai Co., Ltd., Japan, for the sale and service of GNC's Keyprocessing Systems in Japan, the Ryukyu Islands and Korea.

Five exponents of interactive-on-line information services will be featured at session five of the 4th National Meeting of the Information Industry Association to be held Apr. 10-12 at the Roosevelt Hotel, New York.

Twenty-eight firms have been invited by the Electronic Systems Division of the Air Force Systems Command to submit proposals for the replacement of two IBM 360/65s and a Honeywell 1250 at the Military Personnel Center, Randolph Air Force Base, Texas.

Mohawk Data Sciences Corp. and Computing Efficiency, Inc. have approved in principle the acquisition by MDS of Computing Efficiency, Inc., the parent of Buco, Inc., a manufacturer and marketer of magnetic tape drives, including a line of tape drives compatible with IBM computers.

Keypunch Falling

Key-Disk, Terminals Seen Input Kings

NEWTON, Mass. — Shared-processor systems (disk-to-disk) and terminal systems are grabbing increasing shares of the input marketplace, and are expected to be the devices of the future, according to a recent study by International Data Corp. here.

The total installed base of shared-processor systems is expected to jump 48% by the end of this year, to 18,800 units, according to the report. By 1976, there will be 41,600 units in the field.

"Overall trend is toward smaller systems" and the size of the average system will shrink from 10 to seven stations over the next five years, IDC esti-

mated. The average keystation value is expected to fall 38% by 1976, because of continued decreases in component costs, the report states.

Keypunch Decline

While keypunches comprise "almost half" (47.7%) of today's \$24,000 data entry units, and the number is expected to grow by 13,000 by the end of the year, its share of the projected market will decline, to 42.5% in 1972, and only 25.8% in 1976.

A 20% increase in the number of buffer-keypunches is seen by the end of this year while 80-column buffered units will grow 60% to 58,000 and 96-column

buffered units 75%, to a total of 25,600, according to the study.

Single station key-to-tape units will show an 8% growth rate, from 48,450 units in 1971 to 52,700 units in 1976. But by 1976 the number of these units in use will drop to 46,250, below the 1971 total, the firm predicts.

The terminal area as a whole will show a 32% growth rate, from 213,800 installed at the end of 1971 to 282,500 by the end of 1976.

Of this growth, CRT terminals, excluding dedicated ones, will grow from a base of 51,700 to 66,500, or 29% this year, but will jump to 176,400 by the end of 1976, the firm estimates.

Non-CRT terminals now account for 162,100 installations and will grow by 33% to 216,000 this year, IDC says. By 1976 it predicts 662,950 non-CRT terminals would be installed in the field.

The overall growth for OCR will be about 23% this year, according to the report, from 1,760 units to 2,160 units in use, excluding library readers and mark sense readers and bar code readers. By 1976 there will be 4,670 OCR units installed, IDC says.

"The key-to-tape market has passed its peak," according to John J. Colantino, manager of market research.

"Our systems are high-cost ones, are difficult to justify except for very specific applications. But shared-processor systems have reached volume delivery levels, and the terminal sector has received a boom from IBM's introduction of the 3270 CRT data entry system," he added.

Cost savings, improved productivity, and the demand for increased intelligence at the point of data entry are cited as the three primary factors affecting this trend. "These three may actually cause the keypunch room as we know it today to disappear entirely from DP installations," Colantino predicts.

Cost effectiveness will remain the prime issue in the data equipment changes over the next few years. Users currently spend "almost 30% of their total DP budgets for this operation and are becoming acutely aware of the tradeoffs in terms of implementing new applications," according to IDC.

U.S. Computer Exports Decline While Imports Rise in January

WASHINGTON, D.C. — Exports of computer equipment by U.S. manufacturers were down over 10% in January compared with January a year ago, according to statistics released by the Department of Commerce's Bureau of the Census.

At the same time, imports of DP-related equipment were up during the month.

In the first month of 1972, U.S. manufacturers shipped equipment valued at \$92.9 million to overseas locations from U.S. ports, down from \$103.4 million worth of equipment shipped in the same month last year.

The year also started at a lower shipment rate than the end of 1971. The January shipments were down almost 10% from \$100 million, which peaked in December, a date that pushed total 1971 shipments past \$1.1 billion.

Western Europe was the largest single market area during January, with shipments valued at \$50.3 million, according to the Commerce Department. Western Europe also was the largest market last year, the department noted.

Of that amount, members of the European Economic Community received shipments valued at \$33.7 million, while the UK (not yet included in the Common Market figures) imported equipment valued at \$7.4 million and other members of the EEC received \$10.2 million worth of imported equipment valued at \$6.4 million. Other European countries had imports valued at just under \$1 million.

Canada was the next most active market for exports of U.S. equipment, receiving shipments valued at \$14.3 million followed by Japan at \$11.2 million and \$12.0 million worth of U.S.-made computer equipment during the first month of 1972.

The Latin American Free Trade Association was the next most active market, surpassing Asian countries outside of Japan, which had been the top market in 1971. In total, the Latin American nations received equipment valued at \$7.1 million in the next month.

Asian countries, excluding the Near East, had imports amounting to \$4.3 million and Near Eastern countries had imports valued at \$500,000.

Communist areas in Europe received equipment valued at \$100,000, and the exports to Asian communist states were negligible, according to the figures.

The market in Australia was estimated at \$1.6 million for the month, and the

African market was valued at \$700,000.

Most of the U.S. shipments of computer equipment were made by IBM, the department noted, with 3.4 million pounds of equipment valued at \$73.1 million being shipped by air, while only \$4.3 million worth of equipment went by ship.

But while exports of U.S.-made equipment showed a dip during the month, imports of foreign-made equipment showed a sharp rise.

Last January, the U.S. imported \$42.8 million worth of "office machinery and computers," but this year the figure jumped to \$64.3 million. The December figures showed imports of \$62.3 million in January.

The majority of the imports came from Western Europe, from which the U.S. imported equipment valued at \$22.8 million during January. Of this, \$15.1 million came from the European Economic Community and \$4.5 million came from Switzerland, France, and Austria, here, excluding Britain, which accounted for only \$2.8 million worth of the imports.

The second major source for U.S. imports was Canada, which shipped equipment valued at \$22.6 million to the U.S.

Effects Spreading

IBM Moves Hurt Independents

SAN FRANCISCO — Extended memory producers have been hit hard by the IBM move to withhold maintenance from users with such devices — and the effects may be spreading to others in the independent peripheral marketplace.

Computer Investors Group, which markets the extended memories from Data Recal, said its order rate for the device has plummeted since the IBM move in December, even though it previously had been showing a steady growth.

"Users have been scared away from installing these devices," a source at the firm said, "and our business has really been hurt in this area."

Court Case

Another firm marketing the devices, Itel, which is currently suing IBM over the moves, claimed in court that its order had fallen from around eight units

per month to two units per month since the IBM action.

Many industry sources fear the moves will affect marketing of other independent peripherals — even though IBM has gone to great lengths to withhold maintenance on any other products at this time.

"The users are afraid to install non-IBM equipment," one said. "This fear could affect everyone in the business, whether they are marketing main memory, disk drives, tape drives, etc."

"The market is just when we were educating users to the cost savings available by going to independents," another manufacturer said. "Most users were beginning to realize they could get significant savings from the devices."

"But if the user faces a maintenance hazard by going to independence — or even worse, if he thinks there is a possibility of problems — he will play it safe and stick with IBM."

'Spur' Line Printer Controller Adapts 1403s for Use With Non-IBM Units

SANTA MONICA, Calif. — A line printer controller which can couple the IBM 1403 printer to non-IBM systems has been developed by Spur Products Co.

"Now other systems can take advantage of the 1403's many features, such as universal character set, interchangeable chains and trays that offer a selection of type faces, including upper and lower case, high-speed paper slowing and positive paper stacking," according to Spur President Ray Lorenz.

New OEM Products

"The Spur 1403" Lorenz continued, "will be pitched at the OEM market as a supplement to their present printing systems and should provide an answer for those situations where a customer's requirement demands that the 1403 characteristics be matched."

The controller is offered as a basic unit without enclosure, and sells for \$5,500 in quantities of 10 or more.

The device is supplied tested, with all logic cards, memories and mating connectors, all power supplies (except +5V) and instructions for assembly and operation by the company side.

Accessories offered with the controller include a pluggable tester/exerciser, a single-phase to three-phase converter, an endosure and a +5V power supply.

Delivery will begin in May from 2928 Santa Monica Blvd., 90404.

Singer Announces Testers

LITTLE FALLS, N.J. — The SKE-1000 and SKE-1000 SKT 2283 (PAT 203) programmed automatic testers from Kurfess Division of Singer Co. are computer-controlled test systems which can check out such assemblies as A/D converters, analog and digital computers, digital displays, digital processors and similar equipment.

The systems (made up of a general-purpose minicomputer, sine wave generator, dual-channel measurement instrumentation, teletypewriter, mag tape decks, controller and power supplies) can reduce test time dramatically, the company says. One series of tests, involving 1,500 test requirements, was done from 32 hours to 1-1/2 hours, according to the company.

Test programs stored on mag tape may be computer-monitored as required to accommodate test requirements; all test routines are computer-monitored for proper test functions. Test re-

sults are recorded on tape or printer with off-tolerance conditions flagged to the operator. A variety of test and diagnostic software is available.

Other Products

The DPL15, a module that converts eight panel meter BCD outputs to teletypewriter printer/punch inputs, has been developed by Digital Laboratories, Cambridge, Mass., and is priced under \$200 in large quantities.

Computer Labs, Greensboro, N.C., is introducing three high-speed A/D converters capable of 8-, 12- and 16 bits of resolution at word rates from dc through 5 MHz. The models 5605, 5705, and 5805 are priced from \$3,500 to \$4,000.

Ferrofluidics Corp., Burlington, Mass., has a family of magnetic inks, Ferromagnetic Inks, which do not clog or settle, even in the presence of magnetic fields.



HP Uses Honeywell Unit

Hewlett-Packard has turned to Honeywell Micro Switch for the dc motor in its 7970E magnetic tape unit. The motor (shown) drives the unit forward or backward at up to 45 in./sec. Fast forward and rewind operate at 160 in./sec.

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Poland Claims Advanced Mini, Cites Production Lags

By Bohdan O. Szapirowicz
Specialist to Computerworld
WARSAW — Rumored since June 1971, Poland's K-202 minicomputer, which some sources say is one of the most advanced in its class in the world, appears to have arrived at least in prototype form. Besides a claim of 500,000 operations/sec. and 16K words of memory, it has no other characteristics available at this time.

But Jerzy Huk, director of Poland's Mers, the Automation and Instrumentation Industry Association, confirmed the exist-

ence of an advanced minicomputer in an interview reported last month.

The K-202 has been constructed under the direction of Engineer Jacko Karpinski, but his effort parallels the work of engineer B. Pivowar on Odra 1325, a third-generation minicomputer designed by ELWRO, a state research and development center.

Neither machine will be part of the Soviet-led Rad project under which all Eastern European countries and Russia participate in developing a common

IBM 360-like series of machines and peripherals.

No Production Models

As yet there are no production models of the K-202, although plans call for the production of 330 units and move toward the end of the present five-year plan. According to Huk, the 1325 can be manufactured entirely in Poland although some integrated circuitry must still be imported. This also seems to be why progress is slow. The K-202 project is described as a "concept" which presumably involves large-scale integration not avail-

able in Poland at this time.

Huk pointed out that the next step will be completion and acceptance by foreign buyers of the next (second) prototype which may result in several sales abroad.

Apparently this will require a separate plant. The Mera organization is working with Karpinski preparing the anticipated manufacturing capabilities.

How well development is progressing on the advanced K-202 is found in Karpinski's article in a series called "Information

Blockade," published by a Warsaw satirical weekly called "Kulay."

No Support

Although he has a working model of one of the most advanced minicomputers, Karpinski claimed there is no support for this project even though most agree it bring in much needed foreign currency.

Karpinski said even transferred designs must be hand sheet metal are unavailable.

Actually, the K-202 design, according to British press reports, belongs to the Metronome Research, Surrey, which also holds marketing rights to sell the machine in all Eastern European countries except Poland.

The other British firm, M.B. Maritime Electronics, Carlton Electric Holdings Group, was involved in making and financing the computer and signed an agreement with Poland's Metronome last May to market the K-202 in the rest of the world.

Commerce Plans Three European Computer Shows

WASHINGTON, D.C. — The Office of International Trade Promotions of the U.S. Department of Commerce has slated three trade shows for computer equipment in Europe during the next 12 months.

"EDP '74" will be held at the Congress Center in Stockholm, Sweden, Sept. 18-23; U.S. exhibition will be sponsored at "Computer '72" in London, Dec. 4-8; and a show on mini-computers and peripherals is planned for the U.S. Trade Center in Frankfurt on Feb. 13-16, 1973.

The Commerce Department said the areas covered by these exhibits provide excellent export markets for U.S. producers of computers and computer-related equipment.

U.S. computer sales to Scandinavia in 1971 were \$42.1 million, up 40% over 1969 shipments, Commerce said.

The UK imported \$145.7 million of computers from U.S. manufacturers, an increase of 40% over 1969 purchases, it said.

Germany has been "the best market in Europe" for U.S.-made computers and computer-related equipment and products, according to Commerce. U.S. computer sales to Germany in 1971 were \$194.1 million, up 66% over 1969 figures. The total market in Germany is expected to reach \$1.2 billion by 1974, with imports to account for \$300 million.

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 COMPUTERWORLD
THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Fujitsu Completes Experimental Laser Memory System, Plans Computer Use

TOKYO — Fujitsu Ltd. has announced completion of an experimental production of a holographic memory system which can be used with a computer to form an integrated data reading system.

One hologram has a memory capacity of 10 million bits.

In Fujitsu's system, a laser is beamed onto a hologram through a photo shifter and interference pattern is converted into electric signals by a semiconductor probe.

Two methods are employed for the storage of data: one uses the laser to implant data on a hologram.

CNC Lands French Order

LOS ANGELES — CMC France, a subsidiary of Computer Machinery Corp., has landed an order for the purchase of over \$1.6 million worth of tool processing systems from the Chez les Postaux, a department of the French Government. This is CMC France's largest order to date.

Contracts

The contract comprises 14 CNC 9s, each costing 200,000 francs, at seven locations in France. Seven systems already have been delivered to Cheque

Postaux offices in Paris, Lille, Lyon and Grenoble, with another seven scheduled for delivery to Nancy, Limoges and Chalon by September of this year.

The CNC 9s will be primarily in a banking application.

Other Contracts

Autocomp, Inc. has been awarded a contract for the compilation, indexing and publication of the District of Columbia rules and regulations through computerization and electronic publication.

Rapidata, Inc. has signed a one-year agreement to provide dedicated computer services to the New Jersey Bell Telephone Co.

Microdata Corp. has received a \$200,000 contract from the NASA Ames Research Center, Moffett Field, Calif., for eight computer-controlled data communications systems.

Xerox Data Systems has been issued a \$3.5 million contract by the Navy for real-time telemetry processing systems used for in-flight aircraft testing.

Computing and Software, Inc. has received a one-year contract extension from the Air Force to continue its DAS terminal services at the Rocket Propulsion Laboratory, Edwards, Calif.

The Instrumentation Division of Vidor Corp., Mountain View, Calif., has selected Cipher Data Products' line of incremental tape recorders.

Memorex Corp. has awarded a contract to Memory Technology, Inc. for over 100 read only memory systems to provide control storage for Memorex's 660 disk controller.

Comten Inc. has been awarded a contract valued at over \$2 million for hardware, software and maintenance services of a computer switching system for the Atomic Energy Commission's Secure Automatic Communications Network. The system consists of five Comten communications processors.

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Mixed Results Shown by Two Leasing Concerns; Non-DP Activities Credited

SAN FRANCISCO — Two firms engaged in DP leasing activities have reported different earnings pictures, reflecting in part fluctuations in their non-DP activities.

Booth Computer Corp., hindered by a \$1.4 million loss for the fourth quarter, registered earnings of \$1 million for 1971, down from last year's \$2.8 million or \$1.42 per share.

Revenues rose to \$60.5 million from \$45.3 million in the year, and to \$15 million from \$13 million in the fourth quarter.

The loss from continuing operations in the quarter resulted principally from a write-off of obsolete non-computer equipment of Producers Service Corp. and continued expansion of Computer Thermal Systems' marketing and manufacturing capability, noted D.P. Booth Jr., chairman of the board.

Lower earnings for the year also resulted from an extraordinary \$1.1 million charge as a result of a write-down of Atron's investment in Booth Resources International and a \$546,000 loss from that discontinued operation, Booth said. All operations of questionable value have been "discontinued due to lack of marketability," where they should not have any future significant impact on the continued progress of the company, Booth explained.

Meanwhile, Dearborn-Storm

Corp., formerly Dearborn Computer and Marine Corp., reported net earnings of \$10.6 million for the first quarter ended Jan. 31, and a rise in earnings.

The DP leasing and offshore drilling firm indicated 63% of revenue and 61% of earnings in the period came from offshore drilling and marine services business.

Earnings rose 17% from the year's reported a year ago, and earnings reached \$1.1 million or

40 cents per share, compared with \$862,000 or 31 cents per share in the first quarter of last year.

Despite an expected period of "market readjustment" on third-party IBM 360 lease rates, Dearborn-Storm is optimistic about its basic income. In December, it indicated the leasing business was "only 21 months away from completely retiring its share of our total debt."

MDS Sales Outpace Net

HERKIMER, N.Y. — Mohawk Data Systems Corp. attained record revenues in the ninth month ended Jan. 31, but earnings dropped.

Revenues reached \$87 million, up from 1970's reported \$68.1 million; earnings were \$1.6 million or 26 cents per share, down from \$2.8 million or 40 cents per share.

Results were restated to reflect the merger of Atron Corp. on a pooling-of-interests basis and a change in accounting treatment for third-party sales.

The "smooth transition from a number of peripheral equipment to a company marketing data processing systems" adversely affected profits, according to President Richard P. Rifenburgh.

At the same time, during the

last three months, rental revenues, exclusive of the recently acquired Marshall Data Systems, rose by slightly more than \$1 million, he said.

End-user backlog at Jan. 31, excluding Marshall, was at the highest level in the company's history, Rifenburgh noted.

Although rental revenues from the new System 2400 and Key Display System (KDS) were "not significant" these systems accounted for more than 50% of the value of outstanding orders from end users at the end of the period, Rifenburgh said.

CMC, Infotex Claim Records for Year

BURLINGTON, Vt. — Two leaders in the cut-to-disk market have reported records — Infotex in revenues and Computer Machinery Corp. in orders and deliveries.

Infotex's revenues for 1971 amounted to \$4.9 million, including fourth-quarter revenues of \$2.1 million, compared with 1970 revenues of \$791,585. Losses for the year, however, reached \$5.7 million or \$3.98 per share compared to losses equal to \$3.27 per share a year earlier.

At CMC the firm announced record orders of \$33.9 million during 1971, up over 70% from 1970. Equipment delivered to customers increased to \$26.8 million up over 50% from the previous year, according to the firm. The firm claims to have delivered equipment valued at over \$43 million since 1969.

Nickels & Dimes

RCA added to its balance sheet the \$250 million extraordinary charge associated with its withdrawal from the computer business and recorded a \$155.8 million loss for 1971. Total revenues rose to \$3.5 billion, from \$3.3 billion in 1970, when earnings were \$91.3 million, or \$1.16 a share.

SSS

Overall 1971 profits of Sierra Research were reduced by operating losses of its Computer Products Division and its subsidiary, BCD Computing

Corp., according to Siere.

Orders booked for Ultimac Systems' programmed computer system in the first six weeks of '72 exceeded total systems sales for all of 1971.

SSS

Despite a 46% drop in revenue during 1971, to \$6.5 million, component-maker Techtron managed to turn around its profits picture. Earnings were \$206,692 compared with last year's loss of \$88,186.

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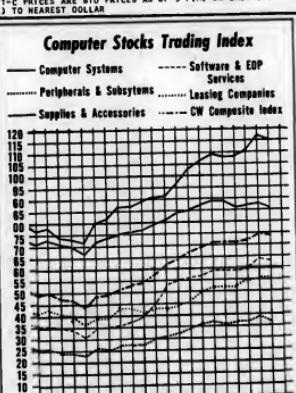
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	71-72 RANGE (1)	CLOSE MAR 16 1972	WEEK CHANGE	WEEK CHANGE	NET PCT CHG	EXCH	71-72 RANGE (1)	CLOSE MAR 16 1972	WEEK CHANGE	WEEK CHANGE	NET PCT CHG	EXCH
SOFTWARE & EDP SERVICES												
O ADVANCED COMP TECH	1 - 4	1 1/2	- 1/8	- 14.2	- 1/8	N	GRAPHIC CONTROLS	6 - 13	1	0	+ 7/8	+ 0.6
O APPLIED DATA RES.	1 - 13	10 1/2	+ 1/8	+ 0.0	+ 1/8	N	MOCORE BUS. FORMS	56 - 145	14 1/2	3 1/8	+ 1 - 1/8	- 2.3
O AUTOMATIC DATA PROC.	1 - 13	2 1/2	+ 1/8	+ 0.0	+ 1/8	N	NASHUA CORP	56 - 145	43 1/2	3 1/8	+ 1 - 1/8	- 2.3
O AUTO SCIENCES	1 - 17	5 1/8	0	0.0	0	N	ONLINE REYNOLO	124 - 23	17 1/2	3 1/4	+ 1 - 1/8	- 0.3
O COMPUTER ASSOCIATIONS	1 - 17	12	0	0.0	0	N	PAD TRADERS CO	8 - 17	17	2 1/8	+ 1/4	+ 0.6
O COMPUTER NETWORK	2 - 11	1 1/2	0	0.0	0	N	PARCO	33 - 36	25 1/2	3 1/8	+ 1/2	+ 1.0
N COMPUTER SCIENCES	6 - 17	9 1/2	+ 7/8	+ 10.1	+ 7/8	N	NABARUS	10 - 20	18 1/2	3 1/8	+ 1/2	+ 1.0
O COMPUTER TECHNOLOGY	2 - 11	8 3/4	+ 3/8	+ 0.0	+ 3/8	N	NALANCE BUS. FORMS	18 - 24	23 1/2	3 1/8	+ 3/8	+ 1.5
O COMPUTER USERS	1 - 13	1 1/2	+ 1/8	+ 0.0	+ 1/8	N	COMPUTER SYSTEMS	6 - 13	1	0	+ 7/8	+ 0.6
O COMPUTER AUTOMATION REPORTS	1 - 13	7	+ 1/8	+ 0.0	+ 1/8	N	BURGESSON CORP	103 - 171	169 1/4	1 1/8	+ 5 1/8	+ 0.6
N COMPUTING & SOFTWARES	17 - 43	23 3/4	- 1/2	- 1.7	- 1/2	N	COLLINS RADIO	10 - 20	18 1/2	3 1/8	+ 1 - 1/8	- 2.3
O CONSHARE	1 - 10	9 5/8	+ 1/8	+ 20.3	+ 1/8	N	CONTRACTS DATA CORP	124 - 23	17 1/2	3 1/4	+ 1 - 1/8	+ 0.6
O DATA AUTOMATION	1 - 4	3 1/8	+ 1/8	+ 5.0	+ 1/8	N	DIGITAL COMP CONTROL	4 - 26	18 1/2	3 1/8	+ 1/2	+ 1.0
O DATA PACKAGING	6 - 10	9 1/8	+ 3/8	+ 7.1	+ 3/8	N	ELectronic ASSOC	1 - 11	10 1/2	1 1/8	+ 1/2	+ 20.0
O DATAMATION SERVICE	1 - 3	1 1/2	+ 1/8	+ 0.0	+ 1/8	N	ELECTRONIC ENGINEER	5 - 14	11 1/8	1 1/8	+ 1/8	+ 0.6
L DAP RESOURCES	1 - 16	8	+ 7/8	+ 3.0	+ 7/8	N	FOXBORO	25 - 46	42 1/2	3 1/8	+ 1/8	+ 0.6
A ELECTRIC COMP PROG	1 - 16	7 7/8	+ 1/8	+ 11.7	+ 1/8	N	GORDON AUTOMATION	30 - 40	38 1/2	3 1/8	+ 1/8	+ 1.5
R ELECTRONIC DATA SYS.	18 - 35	35	+ 3/8	+ 3.0	+ 3/8	N	HONEYWELL INC	87 - 158	148	3 1/8	+ 3/8	+ 5.5
O INFORMATION	6 - 13	8 1/2	+ 3/8	+ 8.1	+ 3/8	N	IBM	281 - 333	333	3 1/8	+ 1/8	+ 0.6
O ITRAC DATA CORP	1 - 3	1 1/2	+ 1/8	+ 1.2	+ 1/8	N	INTERDATA INC	25 - 33	34 1/2	3 1/8	+ 1/8	+ 0.6
A KEYTOP ASSOCIATES	7 - 23	10 1/8	+ 1/8	+ 18.6	+ 1/8	N	NCI	25 - 40	22 3/8	3 1/8	+ 1/8	+ 2.1
O LOGICON	5 - 18	10 1/8	+ 1/8	+ 1.2	+ 1/8	N	NEOTHEON	25 - 46	42 1/2	3 1/8	+ 1/8	+ 0.6
A MANAGEMENT DATA	5 - 13	8 1/8	+ 1/8	+ 3.7	+ 1/8	N	SPERRY RAND	23 - 39	37 1/2	3 1/8	+ 3/8	+ 3.5
O NATIONAL CBS INC	7 - 14	12	0	0.0	0	N	SYS SYSTEMS ENG. LABS	13 - 18	17 1/2	3 1/8	+ 1/2	+ 2.0
O NATIONAL COMPUTER SYSTEMS	7 - 18	10	+ 2 1/2	+ 18.1	+ 2 1/2	N	VICTOR COMPTOMPUTERS	12 - 27	21 1/2	3 1/8	+ 1/2	+ 2.0
O ON LINE SYSTEMS	10 - 29	23 1/2	+ 1/8	+ 1.0	+ 1/8	N	WANG LABS.	29 - 30	38 1/2	3 1/8	+ 1/8	+ 0.6
O PLANNING RESOURCES	10 - 29	23 1/2	+ 1/8	+ 1.0	+ 1/8	N	XEROX CORP	83 - 143	138 1/2	3 1/8	- 2.8	
O PROGRAMMING A SYS	1 - 4	1 1/8	+ 1/8	+ 1.7	+ 1/8	N	LEASING COMPANIES					
O SCIENTIFIC COMPUTERS	2 - 4	3 1/8	+ 1/8	+ 0.0	+ 1/8	N	ACCOHTE COMPUTER	11 - 27	12 3/8	+ 1/8	+ 1.0	
O SIMPLICITY COMPUTER	1 - 5	4 1/2	+ 1/8	+ 2.7	+ 1/8	N	GRASSMAN COMP.	2 - 6	2 3/8	+ 1/8	+ 1.0	
O TDS COMPUTER CENTERS	8 - 13	10	+ 1/8	+ 2.5	+ 1/8	N	COMPUTER EXCHANGE	3 - 14	13 1/8	+ 1/8	+ 1.0	
O TOLLEY INT'L CORP	1 - 9	9 1/2	+ 1/8	+ 4.2	+ 1/8	N	OPFC INC	8 - 19	11 1/2	+ 1/2	0	
O Tymshare Inc	3 - 8	10 1/2	+ 1/8	+ 1.2	+ 1/8	N	DATAFAC RENTAL	5 - 13	8 3/4	+ 1/8	+ 0.6	
O UNITED DATA CENTER	2 - 8	6 3/4	+ 1/8	+ 0.0	+ 1/8	N	DEARBORN-STORM	12 - 25	23 1/8	+ 3/8	+ 3 - 1	
N UNIVERSITY COMPUTING	14 - 28	21 1/2	+ 1/8	+ 1.8	+ 1/8	N	OPA, INC.	1 - 9	6 7/8	+ 1/8	+ 1.0	
N XRS SYSTEMS	2 - 6	7 7/8	+ 1/8	+ 4.7	+ 1/8	N	GRANITE MGT.	7 - 13	11 1/2	0	+ 1/8	
O Vortex Corp	2 - 6	6 3/4	+ 1/8	+ 0.0	+ 1/8	N	INSTRUMENT COMPUTER	16 - 26	23 1/8	+ 1/8	+ 3 - 1	
O XPERIA COMPUTER & SUBSYSTEMS	1 - 17	10 1/2	+ 1/8	+ 8.6	+ 1/8	N	LELECTRO INC	5 - 11	9 3/8	+ 3/8	+ 7.2	
N ADDRESSOGRAPH-MULTICOLOR	24 - 48	39 3/4	- 1 1/8	- 4.2	- 1 1/8	N	NCC INDUSTRIES	11 - 21	19 1/2	3 1/8	+ 1/8	
A ALPHAMERIC	1 - 6	1 1/2	0	0.0	0	N	REEDS COMPUTER	3 - 6	6 3/8	+ 1/8	+ 2.0	
A AMPEX CORP	3 - 10	6 1/2	+ 1/8	+ 5.6	+ 1/8	N	SYSTEMS CAPITAL	3 - 7	7 1/2	+ 1/8	+ 0.2	
A ANDERSON JACOBSON	3 - 10	6 1/2	+ 1/8	+ 5.6	+ 1/8	N	S.U. LEASING	16 - 48	46 3/8	+ 1/8	+ 0.2	
O ATLANTIC TECHNOLOGY	3 - 9	7 3/4	+ 1/8	+ 11.1	+ 1/8	N	EXCH: N-Y NEW YORK EXCHANGE; A-AMERICAN EXCHANGE L-LATINATIONAL EXCHANGE; O-OVER-THE-COUNTER					
N BANNER & NEW	6 - 17	10 1/2	+ 1/8	+ 8.6	+ 1/8	N	O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST 60 10 1/2 TO NEAREST DOLLAR					
O CALCOMP	19 - 33	21 1/2	+ 1/8	+ 12.8	+ 1/8							
O Cognitronics	2 - 6	5 3/4	+ 1/8	+ 3.5	+ 1/8							
O COMPUTER COMMUN.	5 - 15	5 7/8	+ 1/8	+ 3.1	+ 1/8							
O COMPUTER EQUIPMENT	20 - 26	7 1/2	+ 1/8	+ 1.6	+ 1/8							
O CONSO COMPUTER CORP.	1 - 10	5 3/8	+ 1/8	+ 2.1	+ 1/8							
O DATA RECOGNITION	3 - 8	5	+ 1/8	+ 3.8	+ 1/8							
O DATA TECHNOLOGY	1 - 9	5 1/2	+ 1/8	+ 12.5	+ 1/8							
O DIA/M CONTROL	3 - 7	5 1/2	+ 1/8	+ 0.0	+ 1/8							
O ELECTRONIC & M	16 - 34	6 5/8	+ 1/8	+ 5.6	+ 1/8							
F FABRI-TEK	2 - 3	5	+ 1/8	+ 1.1	+ 1/8							
O GENERAL COMPUTER SVCS	20 - 34	31 1/2	+ 1/8	+ 33.7	+ 1/8							
N GENERAL ELECTRIC	53 - 114	63 1/2	+ 1/2	+ 0.7	+ 1/2							
N GTE	1 - 10	11 1/2	+ 1/8	+ 2.1	+ 1/8							
O INFREX INC	17 - 59	53	+ 2	+ 5.4	+ 2							
O INFORMATION DISPLAYS	3 - 7	5 1/2	+ 1/8	+ 0.0	+ 1/8							
O INFORMATION ASSIST	3 - 7	5 1/2	+ 1/8	+ 0.0	+ 1/8							
N MARSHALL INDUSTRIES	20 - 27	22 1/2	+ 1/2	+ 11.0	+ 1/2							
N MCNREX	20 - 78	29 1/2	+ 1/2	+ 1.4	+ 1/2							
A MILGO ELECTRONICS	12 - 34	31 7/8	+ 1/8	+ 4.5	+ 1/8							
N MULTICOM	1 - 10	12 1/2	+ 1/8	+ 1.8	+ 1/8							
O OPTICAL SCANNING	8 - 18	15 1/2	+ 1/8	+ 9.3	+ 1/8							
O PERTEC CORP	9 - 18	15 5/8	+ 1/8	+ 1.1	+ 1/8							
O PRECISION INSTR.	11 - 23	18	+ 1/8	+ 5.0	+ 1/8							
O PRECISION INST.	7 - 16	8 1/4	+ 1/8	+ 3.5	+ 1/8							
O RECOGNITION EQUIP	8 - 26	11	+ 1 1/2	+ 13.1	+ 1 1/2							
O RECOR CORP	2 - 12	3 1/2	+ 1/8	+ 1.0	+ 1/8							
O RICOH COMPUTER ASSOCIATES	2 - 22	19 3/4	+ 1/8	+ 1.2	+ 1/8							
O SCM DATA	8 - 15	11 1/2	+ 1/8	+ 5.8	+ 1/8							
O SYCOM INC	1 - 10	11 1/2	+ 1/8	+ 3.6	+ 1/8							
O TECNOLY CORP.	6 - 18	9 1/2	+ 1/8	+ 3.6	+ 1/8							
N TEKTRONIX INC	28 - 64	43 5/8	+ 1/8	+ 0.8	+ 1/8							
N TELEX	8 - 22	12 3/8	+ 1/2	+ 3.4	+ 1/2							
O SUPPLIES & ACCESSORIES												
N ADAMS-MILLIS CORP	8 - 18	18 5/8	+ 1/8	+ 8.6	+ 1/8							
N BALTIMORE BUS. FORMS	1 - 10	10 1/2	+ 1/2	+ 7.1	+ 1/2							
N BARRY WRIGHT	7 - 13	11	+ 1/2	+ 10.2	+ 1/2							
N DATA DOCUMENTS	1 - 10	10 5/8	+ 1/8	+ 1.0	+ 1/8							
N DATA PROCESSORS INC	1 - 10	12 1/2	+ 1/8	+ 1.8	+ 1/8							
N ENNIS BUS. FORMS	3 - 13	12 7/8	+ 1/8	+ 4.1	+ 1/8							
N GRAHAM MAGNETICS	9 - 35	23 1/2	+ 1/8	+ 4.4	+ 1/8							



Earnings Reports

INTERDATA	
Year Ended Dec. 31	1971
Revenue	\$7,100,000
Net Income	6,58,400
EPS	13.40

TELEX

BUNKER RAMAK	
Year Ended Dec. 31	1971
Revenue	\$1,000,000
Net Income	3,28
EPS	3.28

BOLT BERANEK & NEWTON	
Three Months Ended Dec. 31	1971
Revenue	\$1,100,000
Net Income	8,16
EPS	9.05

APPLIED MAGNETICS	
Three Months Ended Dec. 31	1971
Revenue	\$1,07,000
Net Income	5,05
EPS	4.67

MICROFORM DATA SYSTEMS	
Six Months Ended Dec. 31	1971
Revenue	\$1,000,000
Net Income	1,45,672
EPS	1,45,672

LEASO	
Three Months Ended Dec. 31	1971
Revenue	\$1,43
Net Income	1,43,672
EPS	1,43,672

DATA/DESIGN CONSOLIDATED	

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